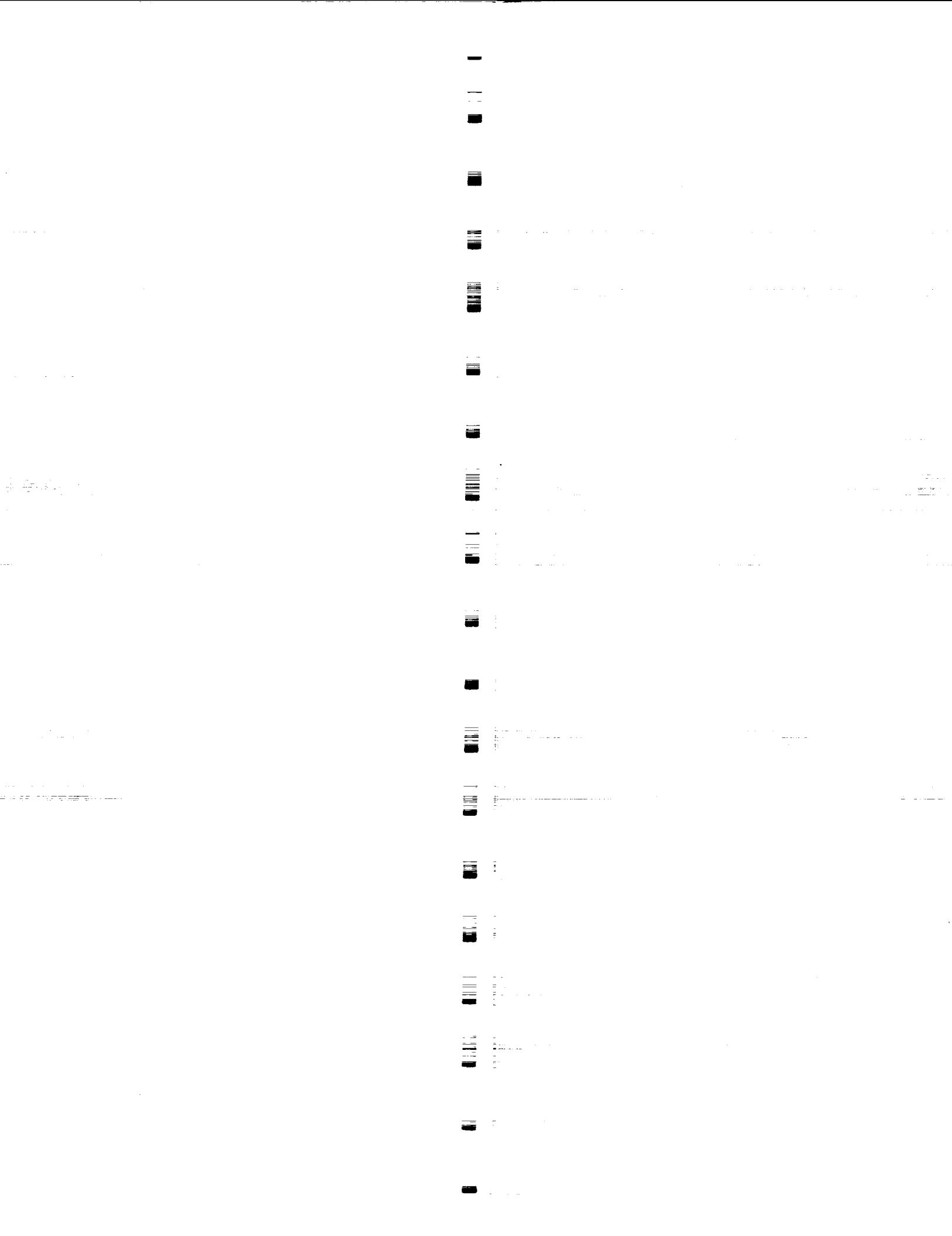


INDEPENDENT ORBITER ASSESSMENT

ANALYSIS OF THE LANDING/DECELERATION SUBSYSTEM

12 JANUARY 1987



MCDONNELL DOUGLAS ASTRONAUTICS COMPANY
HOUSTON DIVISION

SPACE TRANSPORTATION SYSTEM ENGINEERING AND OPERATIONS SUPPORT

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INDEPENDENT ORBITER ASSESSMENT
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Independent Orbiter Assessment
Analysis of the Landing/Deceleration Subsystem

1.0 EXECUTIVE SUMMARY

The McDonnell Douglas Astronautics Company (MDAC) was selected in June 1986 to perform an Independent Orbiter Assessment (IOA) of the Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL). Direction was given by the STS Orbiter and GFE Projects Office to perform the hardware analysis using the instructions and ground rules defined in NSTS 22206, Instructions for Preparation of FMEA and CIL, 10 October 1986. The IOA approach features a top-down analysis of the hardware to determine failure modes, criticality, and potential critical items. To preserve independence, this analysis was accomplished without reliance upon the results contained within the NASA FMEA/CIL documentation. This report documents (Appendix C) the independent analysis results corresponding to the Orbiter Landing/Deceleration Subsystem hardware.

The Landing/Deceleration Subsystem is utilized to allow the Orbiter to perform a safe landing, allowing for landing-gear deploy activities, steering and braking control throughout the landing rollout to wheel-stop, and to allow for ground-handling capability during the ground-processing phase of the flight cycle. Specifically, the Landing/Deceleration hardware consists of the following components:

- o Nose Landing Gear (NLG)
 - NLG Shock Strut Assembly
 - NLG Doors and Uplock Mechanism
 - NLG Wheels and Tires
- o Main Landing Gear (MLG)
 - MLG Shock Strut Assembly
 - MLG Doors and Uplock Mechanisms
 - MLG Wheels and Tires
- o Brake & Antiskid (B&AS)
 - B&AS Controls
 - Brake Mechanisms
- o Electrical Power Distribution and Controls (EPD&C)
- o Nose Wheel Steering (NWS)
- o Hydraulics Actuators

The IOA analysis process utilized available Landing/Deceleration hardware drawings and schematics for defining hardware assemblies, components, and hardware items. Each level of hardware was evaluated and analyzed for possible failure modes and effects. Criticality was assigned based upon the severity of the effect for each failure mode.

Figure 1 presents a summary of the failure criticalities for five of the six major subdivisions of the Landing/Deceleration Subsystem. The NWS analysis is not included with this report. The NWS was originally included with this subsystem, but in order to

conform with NASA alignment it has been identified as a separate subsystem. A summary of the number of failure modes, by criticality, is presented below with hardware criticality first and functional criticality second.

Summary of Failure Modes By Criticality (HW/F)							
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
Number :	63	27	0	63	0	103	256

For each failure mode identified, the criticality and redundancy screens were examined to identify critical items. A summary of potential critical items is presented as follows:

Summary of Potential Critical Items (HW/F)						
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
Number :	63	27	0	34	0	124

Due to the lack of redundancy in the Landing/Deceleration Subsystems there is a high number of critical items.

LANDING/DECELERATION ANALYSIS SUMMARY OVERVIEW

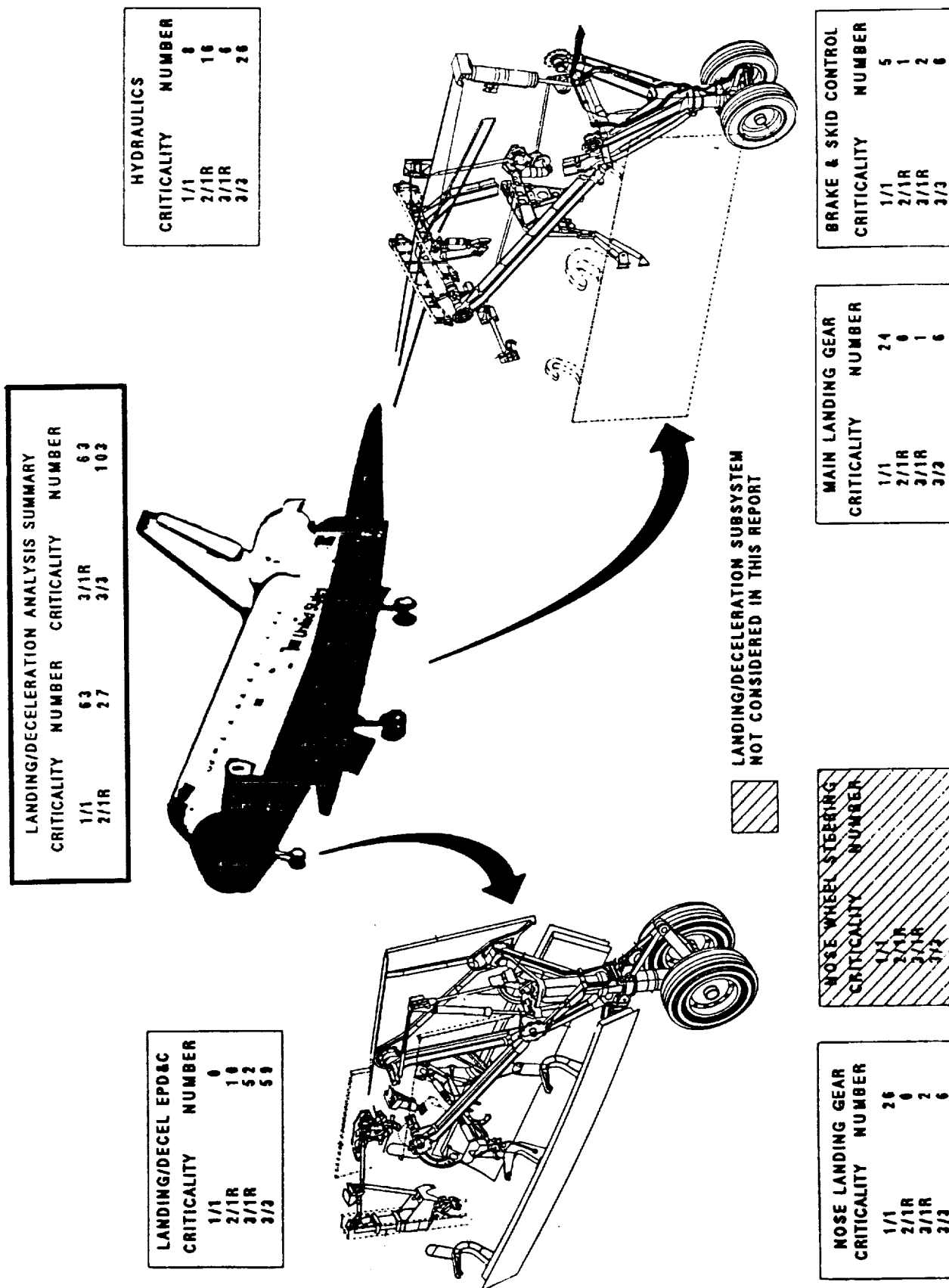
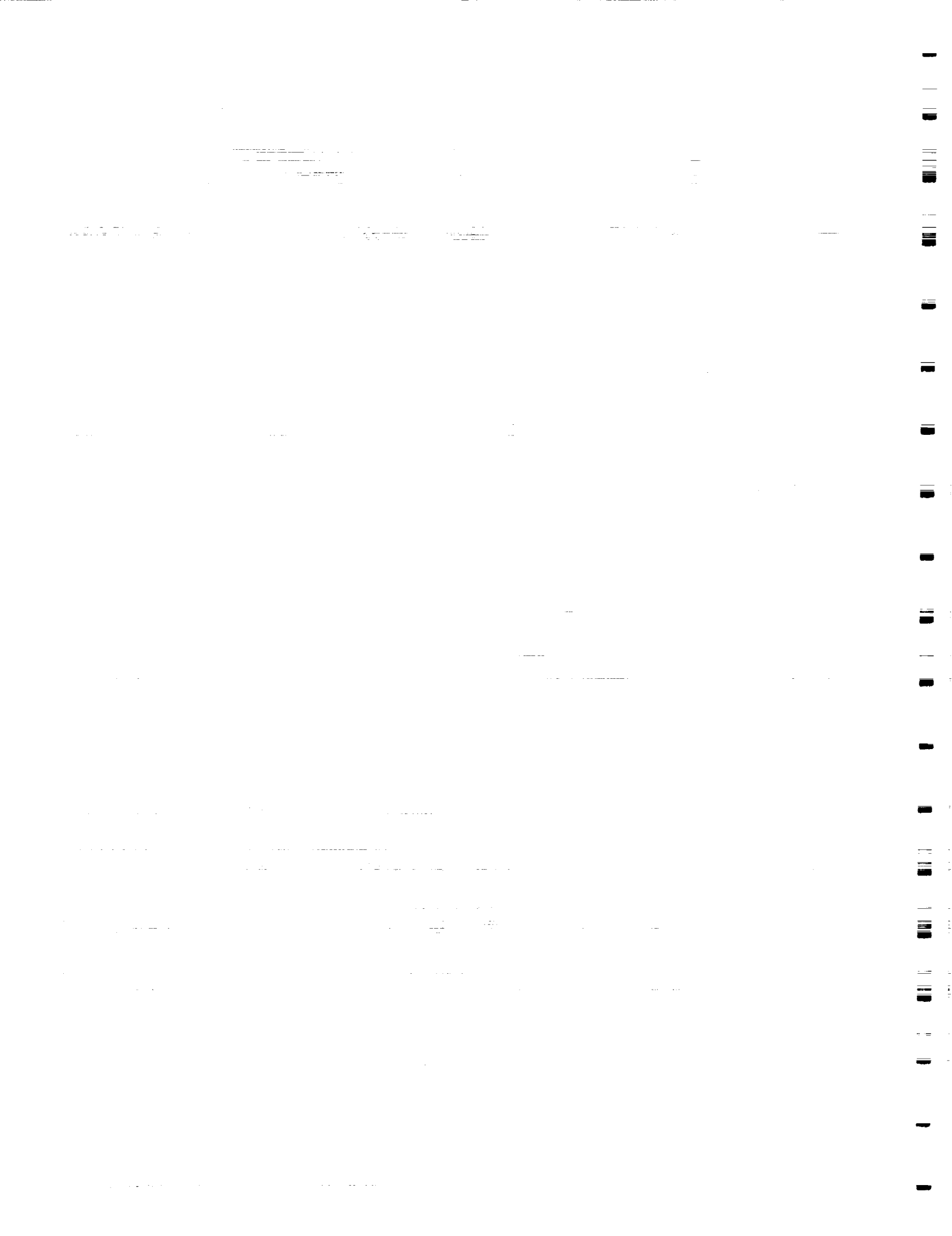


Figure 1 - LANDING/DECELERATION ANALYSIS SUMMARY OVERVIEW.



2.0 INTRODUCTION

2.1 Purpose

The 51-L Challenger accident prompted the NASA to readdress safety policies, concepts, and rationale being used in the National Space Transportation System (NSTS). The NSTS Office has undertaken the task of reevaluating the FMEA/CIL for the Space Shuttle design. The MDAC is providing an independent assessment of the Orbiter FMEA/CIL reevaluation results for completeness and technical accuracy.

2.2 Scope

The scope of the independent FMEA/CIL assessment activity encompasses those Shuttle Orbiter subsystems and GFE hardware identified in the Space Shuttle Independent FMEA/CIL Assessment Contractor Statement of Work. Each subsystem analysis addresses hardware, functions, internal and external interfaces, and operational requirements for all mission phases.

2.3 Analysis Approach

The independent analysis approach is a top-down analysis utilizing as-built drawings to breakdown the respective subsystem into components and low-level hardware items. Each hardware item is evaluated for failure mode, effects, and criticality. These data are documented in the respective subsystem analysis report, and are used to assess the NASA and Prime Contractor FMEA/CIL reevaluation results. The IOA analysis approach is summarized in the following Steps 1.0 through 3.0. Step 4.0 summarizes the assessment of the NASA and Prime Contractor FMEAs/CILs that is performed and documented at a later date.

Step 1.0 Subsystem Familiarization

- 1.1 Define subsystem functions
- 1.2 Define subsystem components
- 1.3 Define subsystem specific ground rules and assumptions

Step 2.0 Define subsystem analysis diagram

- 2.1 Define subsystem
- 2.2 Define major assemblies
- 2.3 Develop detailed subsystem representations

Step 3.0 Failure events definition

- 3.1 Construct matrix of failure modes
- 3.2 Document IOA analysis results

Step 4.0 Compare IOA analysis data to NASA FMEA/CIL

- 4.1 Resolve differences
- 4.2 Review in-house
- 4.3 Document assessment issues
- 4.4 Forward findings to Project Manager

2.4 Landing/Deceleration Ground Rules and Assumptions

The Landing/Deceleration ground rules and assumptions used in the IOA are defined in Appendix B. The subsystem specific ground rules were defined to limit the analysis to single-failed parts for each failure.

3.0 SUBSYSTEM DESCRIPTION

3.1 Design and Function

The Landing/Deceleration Subsystem consists of the hardware required to perform landing and rollout to a safe stop. In addition, the Landing/Deceleration Subsystem performs the function of transporting the Orbiter during the landing phase and towing during post mission operations. The Landing/Deceleration Subsystem consists of the following components:

1. The Nose Landing Gear Shock Strut Assembly (NGSSA) is the assembly that supports the nose of the Orbiter during landing and ground-handling operations. The NGSSA consists of the Shock Strut, Axle, Steering/Damping Actuator, Torque Arms, Drag Brace, Lock Brace, and attaching hardware (Figures 2 and 3)
2. The Nose Landing Gear Doors and Uplock/Release Mechanisms (Figures 2 and 3) consist of the following components that function when the landing gear deploy switch is activated:
 - o Extend/Retract Hydraulic Strut Actuator
 - o Door Extend Retract Mechanism
 - o Door Over-Center Bungee
 - o Gear Uplock Hook
 - o Door Hooks
 - o Door Hook Actuation Linkage
 - o NLG Uplock Release Hydraulic Actuator
 - o Backup Pyro Uplock Release Actuator
 - o NLG Extension Booster Pyro Actuator
 - o Door Bungee Assist Assembly
3. The data for the Nose Landing Gear Wheels and Tires are not currently available for use in the evaluation of the wheels or the tires. B. F. Goodrich drawings were requested through NASA, Rockwell International (Downey Operations) and through B. F. Goodrich (Troy, Ohio). Some analysis has been performed using the Rockwell Procurement Specifications which were available through NASA.
4. The two Main Landing Gear Shock Strut Assemblies (MGSSA) support the aft portion of the Orbiter during landing and ground handling activities. The MGSSA consists of the Shock Strut, Axle, Torque Arms, Drag Brace, Lock Brace, and attaching hardware (Figures 4 and 5).

5. The Main Landing Gear Doors and Uplock Mechanisms (Figures 4 and 5) consists of the following components that function when the landing gear deploy switch is activated:
 - o Extend/Retract Hydraulic Strut Actuator
 - o Door Extend Retract Mechanism
 - o Door Over-Center Bungee
 - o Gear Uplock Hook
 - o Door Hooks
 - o Door Hook Actuation Linkage
 - o MLG Uplock Release Hydraulic Actuator
 - o Backup Pyro Uplock Release Actuator
 - o Door Bungee Assist Mechanism
6. The data for the Main Landing Gear Wheels and Tires are not currently available for use in the evaluation of the wheels or the tires. B. F. Goodrich drawings were requested through NASA, Rockwell (Downey Operations) and through B. F. Goodrich (Troy, Ohio). Some analysis has been performed using the Rockwell Procurement Specifications which were available through NASA.
7. The data for the Brake and Antiskid Controls are limited and the assessment was performed using the data available in the Space Shuttle Systems Handbook, the Shuttle Flight Operations Manual, Volume 10D, the Rockwell Procurement Specification, Brake/Skid Control Subsystem, Wheel Brakes - Main Landing Gear, Orbiter, and the NASA Training Document on Landing/Deceleration Subsystems, LNDG/DECEL 2102. Data were requested on the Mark III Skid Control System, but we were informed that the data were proprietary and that the data would not be made available for the assessment. Current data were requested through NASA and Rockwell International, Downey Operations. The Brake and Antiskid Controls consist of the Rudder/Brake Pedal Assembly and the Brake/Skid Control System as identified in Figure 6.
8. The data for the Brake System are not currently available for use in the evaluation of the system. B. F. Goodrich drawings were requested through NASA, Rockwell International, Downey Operations, and through B. F. Goodrich (Troy, Ohio). Some analysis has been performed using the Rockwell Procurement Specifications which were available through NASA. Some data were found on the Orbiter braking system through Lockheed in Clear Lake through the notes from the AD HOC COMMITTEE - ORBITER BRAKING SYSTEM ASSESSMENT documents. The brake system consists of four electro-hydraulic disc-braking systems. Each assembly has nine discs: four rotors and five stators. The rotors are splined to the inside of the wheel and rotate with

the wheel. The stators are splined to the outside of the axle assembly and do not rotate. When the brakes are applied, eight hydraulic actuators in the brake assembly press the discs together, thus providing the braking torque. The hydraulic brake actuators are distributed evenly around the discs. Four of the actuators are manifolded into a brake chamber and are powered by a single hydraulic system. The remaining four are manifolded into a second braking chamber and are powered by a different hydraulic system.

9. The Rudder/Brake Pedal Assembly (R/PBA) is the mechanical assembly that allows the crew to make manual inputs into the Landing/Deceleration Subsystems. The R/BPA converts the manual inputs into electrical data that is transmitted to the flight control systems, the brake controls, and the nose wheel steering. Each R/BPA contains two brake-pedal transducer units called the Rudder Pedal Transducer Assemblies (RPTA). Each unit has four Linear Variable Differential Transducers (LVDT) which output 0-5 VDC brake signals to the brake/skid control boxes A and B. Each of the transducer units output four separate braking signals for the respective left/right-brake control for the associated braking system.
10. The Electrical Power Distribution and Control (EPD&C) consists of two subsystems within the Landing/Deceleration Subsystem: Landing Gear Control and Brake and Antiskid. The landing Gear Control system provides power to the Nose and Main Landing Gear Doors and uplock/Release Mechanisms on the orbiter (Figure 7.) The Brake and Antiskid subsystem transfers brake and skid control power to the Brake/Skid Control Boxes A and B (Figure 6). Power is also provided to the hydraulic brake-line heater coils for orbiter hydraulic fluid heating. EPD&C powers the electronics for sensing and monitoring the discrete position of moving parts and assemblies within the Landing/Deceleration subsystem.
11. The responsibility for the Nose Wheel Steering system has been assigned to the NWS Group. The FMEA's for the NWS were originally included in the Landing/Deceleration Subsystem. The mechanical-linkage portions of the NWS are still included in the Landing/Deceleration IOA reports as a portion of the Nose Landing Gear reports.
12. The Hydraulics Actuators on the Landing/Deceleration Subsystem consists of six actuators. Three actuators, one in each wheel well, activate the landing gear uplock mechanism that initiates the landing gear deploy sequence for that landing gear, and three actuators perform the task of extending or retracting the landing

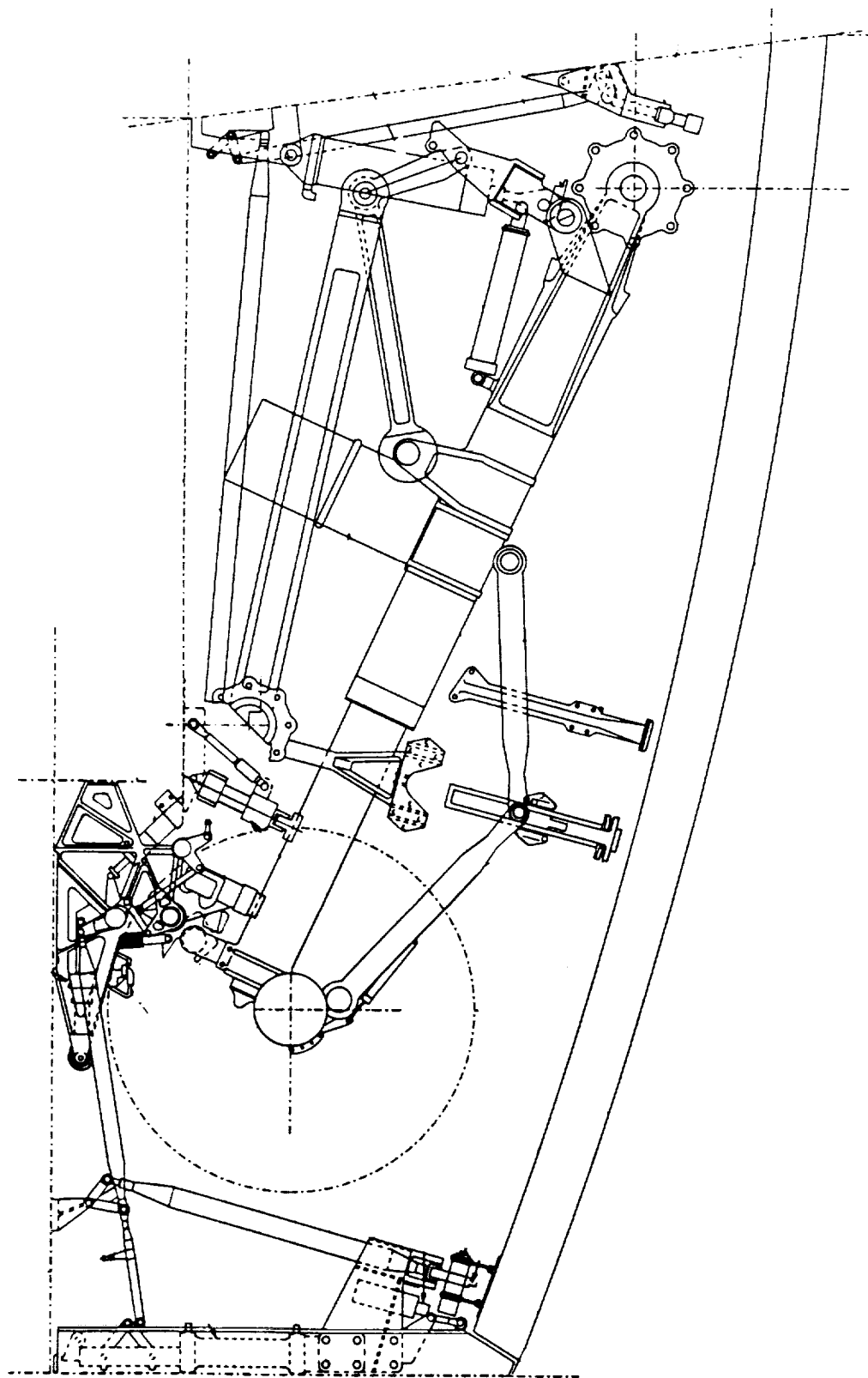
gear. Landing gear retraction can only be performed by Ground Support Equipment (GSE); a landing gear retraction cannot be supported on orbit. These actuators are actually components of the subsystems listed in paragraphs 3.1.2 and 3.1.5 of this section. However, for this report they are broken out separately for the purpose of clarity.

3.2 Interfaces and Locations

The Landing/Deceleration hardware consists of six major subcomponents located in the Orbiter's cabin area and on the under carriage of the Orbiter. The interfaces for the subsystem are relatively simple in that there is a limited number of interfaces with the other subsystems on the Orbiter. The interfaces with the other subsystems are basically limited to interfaces with the Data Processing System (DPS) for backup flight control for the NWS and for instrumentation on the Landing/Deceleration hardware, and the Hydraulics System (HYD) for hydraulics system pressure for the subsystem actuators and for the brakes. The remainder of the subsystem is capable of direct control, via wire, from the control device to the subsystem hardware.

3.3 Hierarchy

Figure 8 illustrates the hierarchy of the Landing/Deceleration Subsystem hardware and the corresponding subcomponents. Figures 2 through 7 comprise the detailed subsystem representations.



NOSE LANDING GEAR STOWED

Figure 2 - NOSE LANDING GEAR - STOWED POSITION

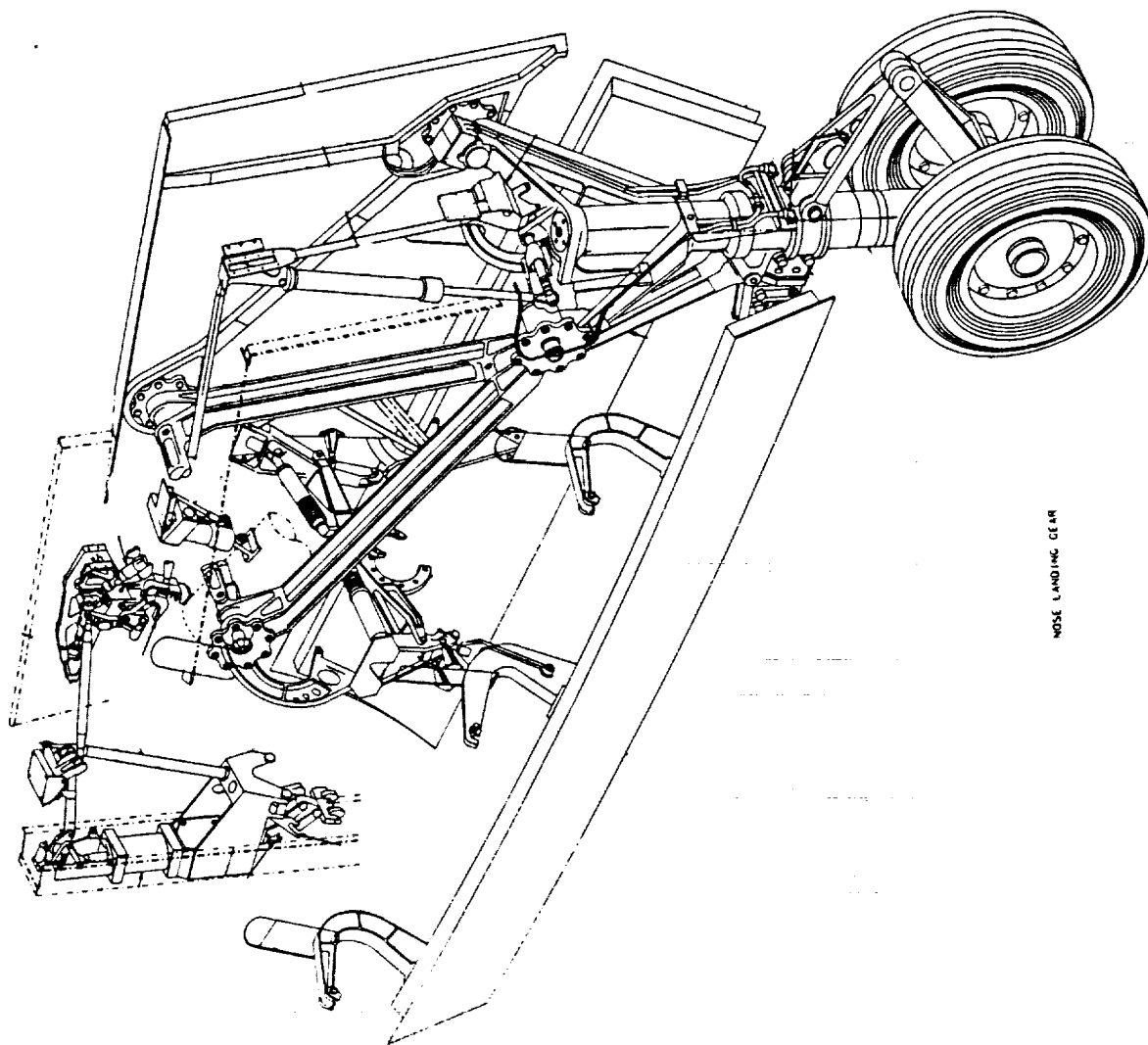
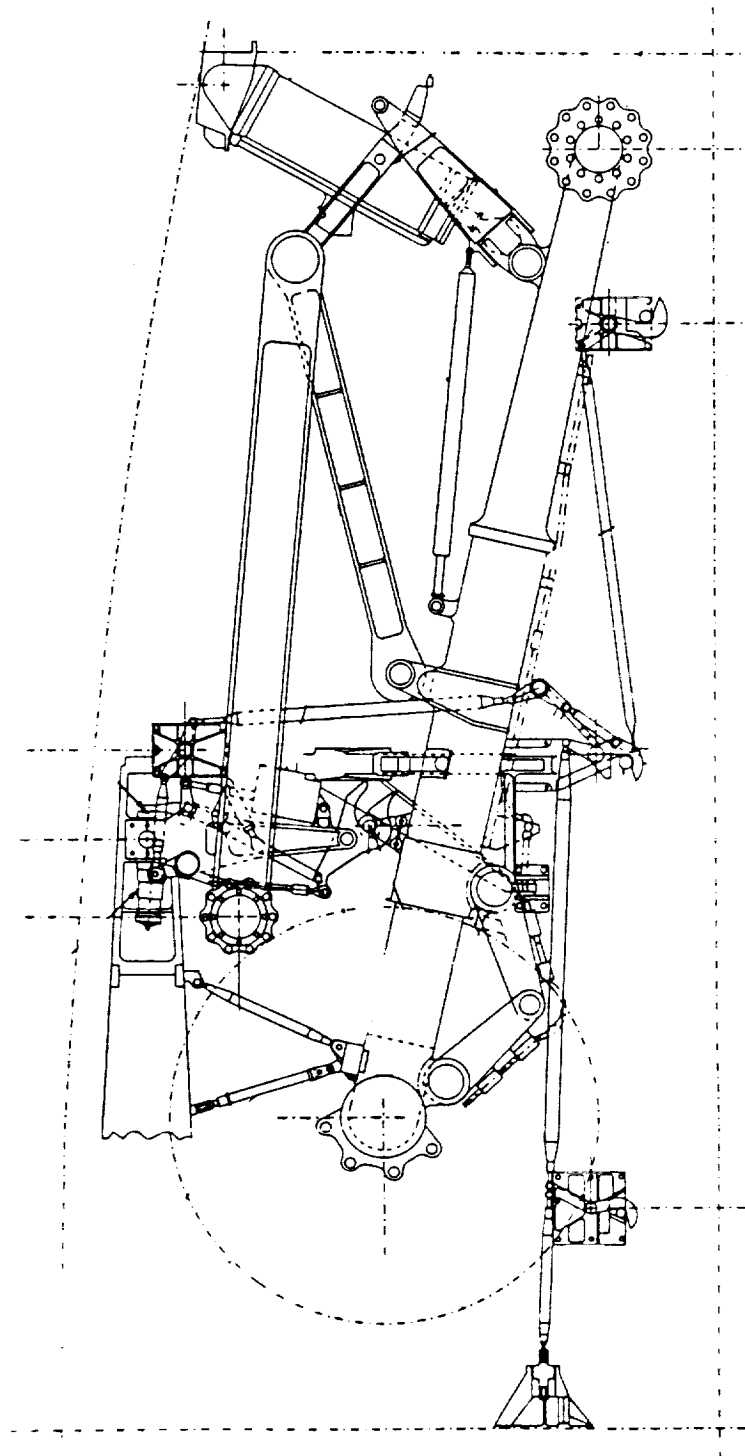


Figure 3 - NOSE LANDING GEAR - EXTENDED POSITION



MAIN LANDING GEAR STOWED

Figure 4 - MAIN LANDING GEAR - STOWED POSITION

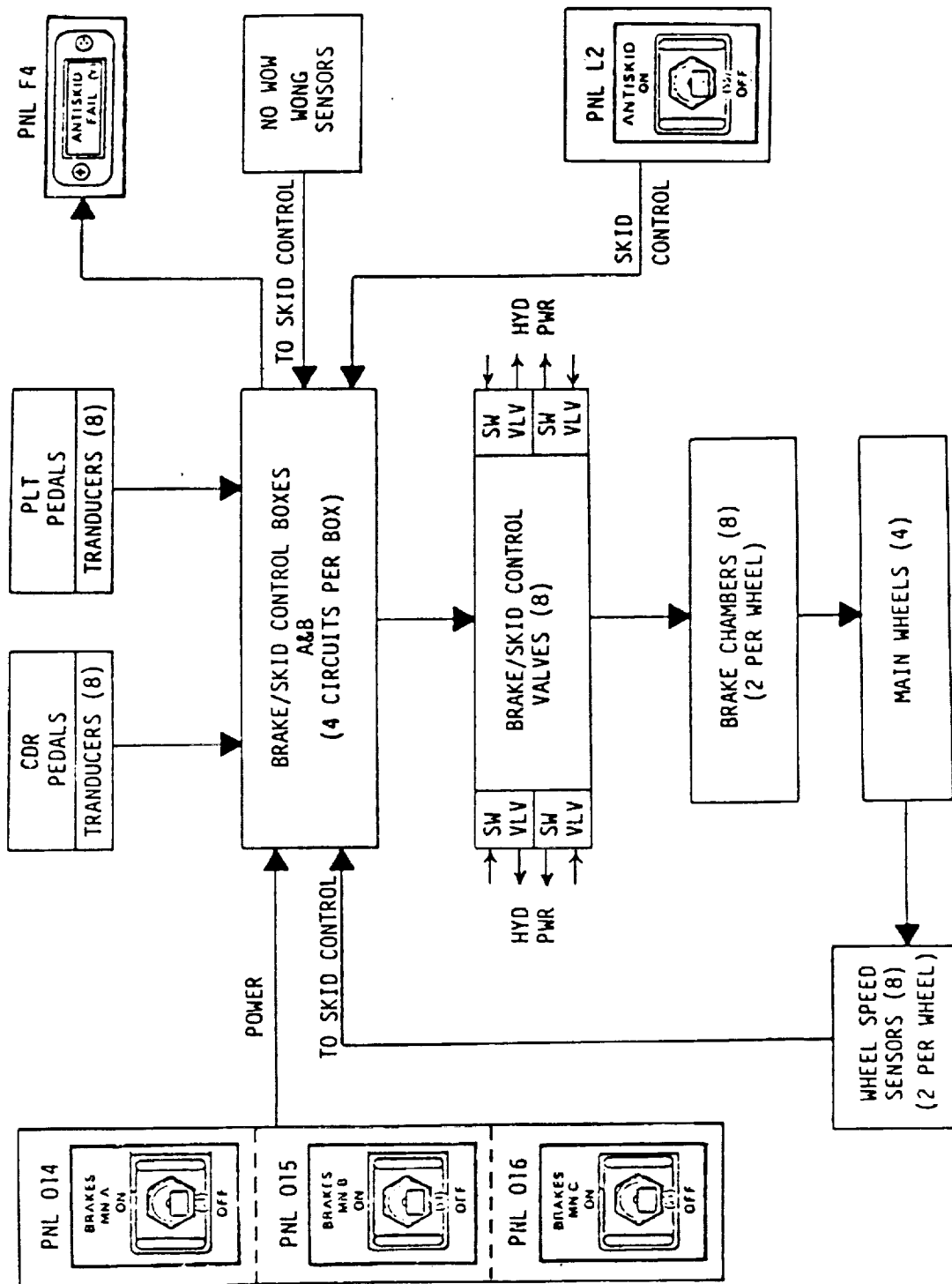


Figure 6 - BRAKE/SKID CONTROL SYSTEM OVERVIEW

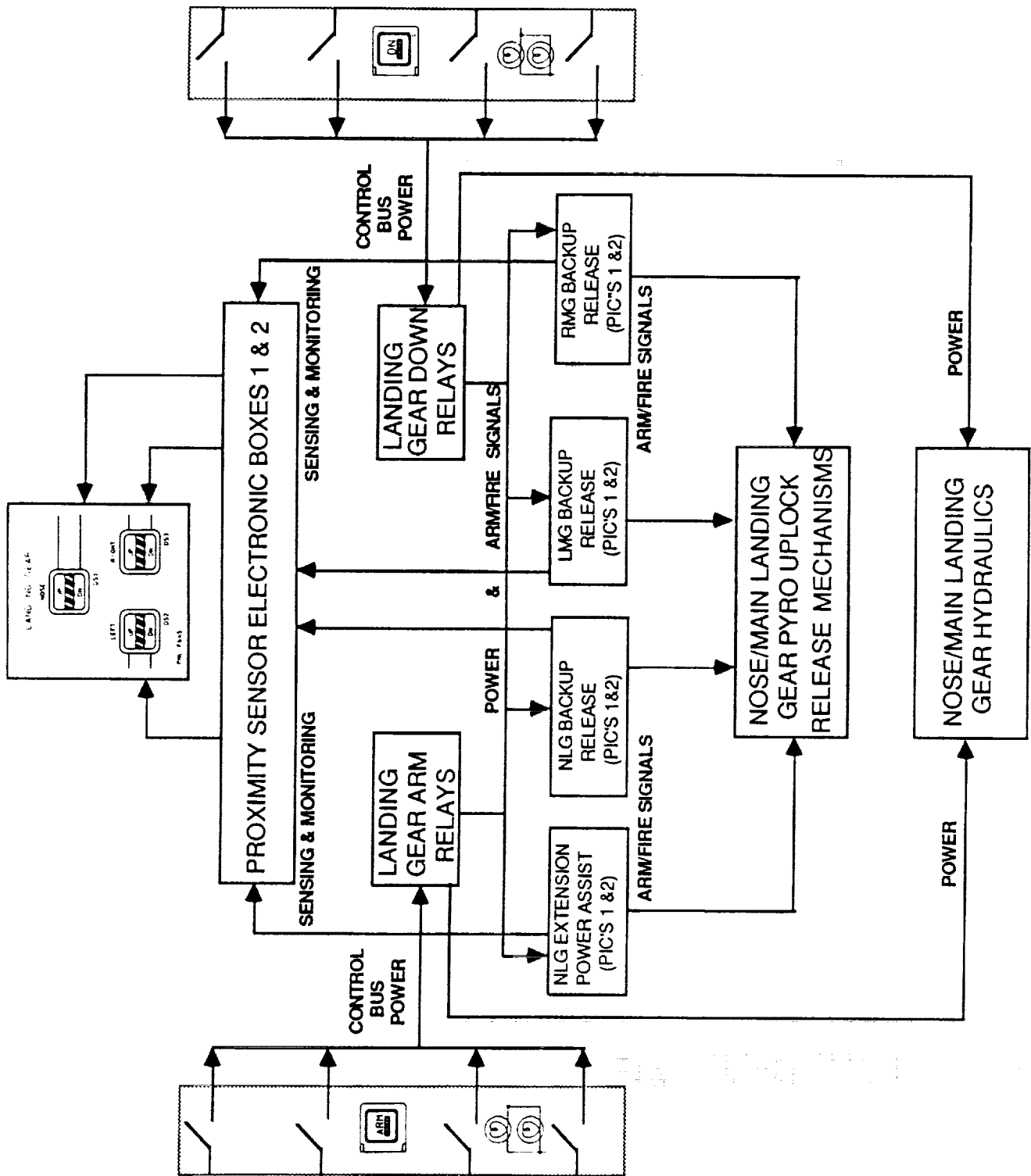
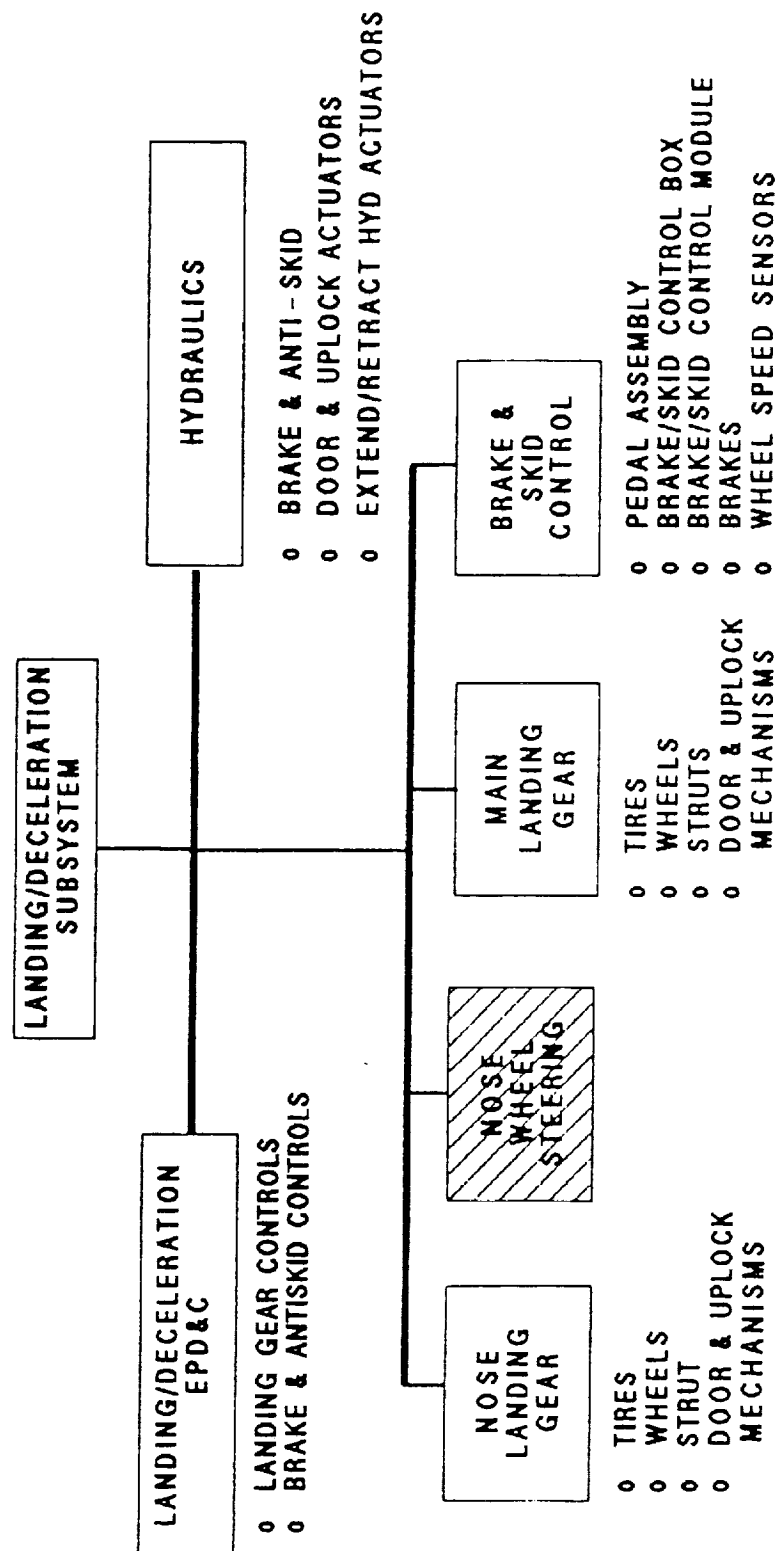


Figure 7 - LANDING GEAR CONTROL SYSTEM OVERVIEW

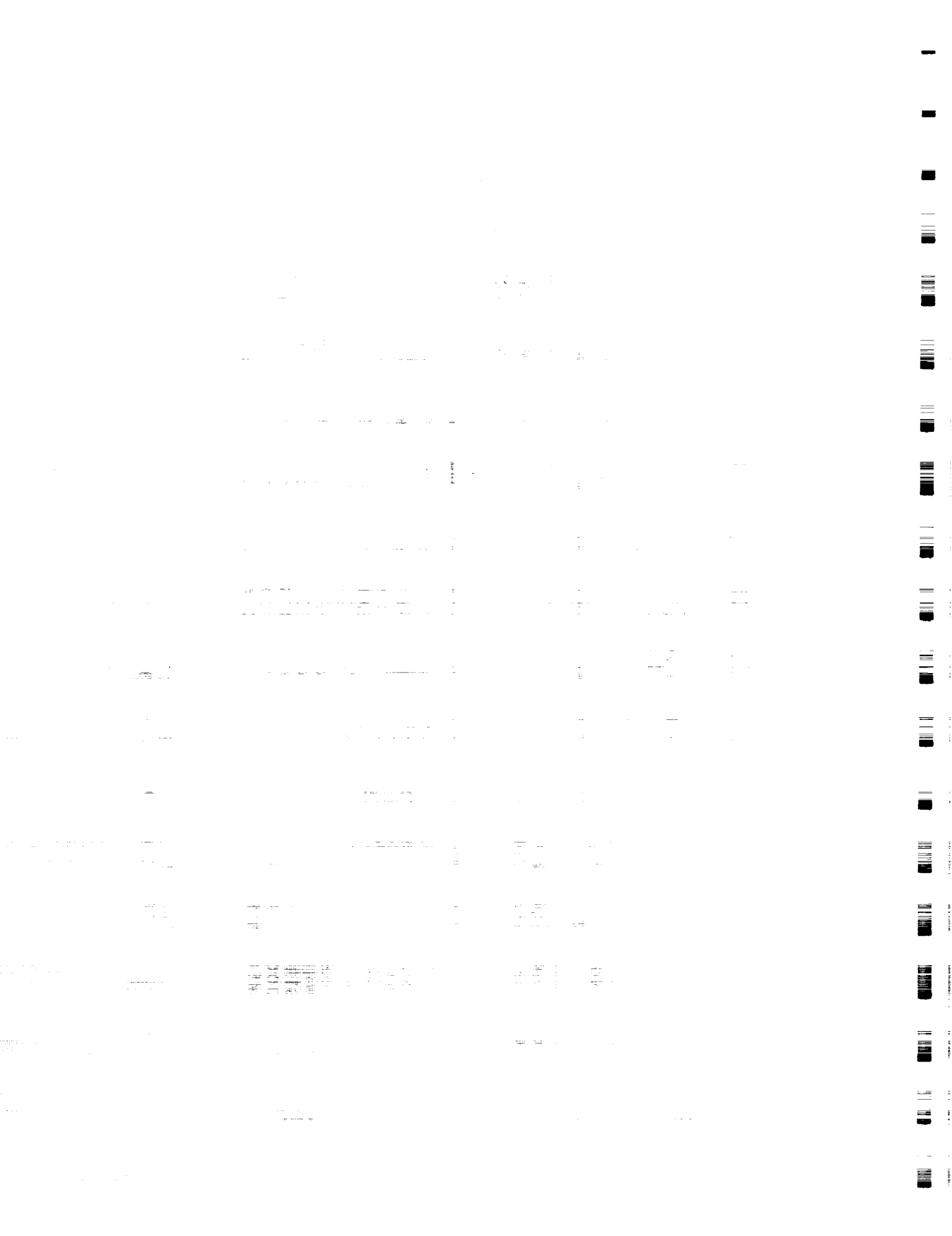
LANDING/DECELERATION OVERVIEW



LANDING/DECELERATION SUBSYSTEM
NOT CONSIDERED IN THIS REPORT



Figure 8 - LANDING/DECELERATION OVERVIEW



4.0 ANALYSIS RESULTS

Detail analysis results for each of the identified failure modes are presented in Appendix C. Table I presents a summary of the failure criticalities. Further discussion of each of these subdivisions and the applicable failure modes is provided in subsequent paragraphs.

TABLE I Summary of Possible Failure Modes and Criticalities							
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
NLG	26	0	-	2	-	6	34
MLG	24	0	-	1	-	6	31
B&AS	5	1	-	2	-	6	14
EPD&C	0	10	-	52	-	59	121
NWS			-		-		
HYD	8	16	-	6	-	26	56
TOTAL	63	27	0	63	0	103	256

Of the 256 failure modes analyzed, 63 resulted in the immediate loss of the crew or the vehicle, and 90 resulted in the loss of the crew or the vehicle with the failure of redundant operations. There were no failures that were identified that would result in the direct loss of the mission without the loss of the crew or the vehicle. A summary of the potential critical items (PCIs) is presented in Table II. Appendix D presents a cross reference between each PCI and a specific worksheet in Appendix C.

TABLE II Summary of Potential Critical Items							
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
NLG	26	0	-	2	-	-	28
MLG	24	0	-	1	-	-	25
B&AS	5	1	-	1	-	-	7
EPD&C	0	10	-	28	-	-	38
NWS			-		-	-	
HYD	8	16	-	2	-	-	26
TOTAL	63	17	0	34	0	0	124

4.1 Analysis Results NLG.

The NLG consists of the NLG Shock Strut Assembly, the NLG Doors and Uplock Mechanisms, and the NLG Wheels and Tires. Assessment of the wheels and tires were limited due to the nonavailability of data on these parts. Twenty-eight PCIs were identified, these items are listed in Appendix D.

4.2 Analysis Results MLG.

The MLG consists of the MLG Shock Strut Assembly, the MLG Doors and Uplock Mechanisms, and the MLG Wheels and Tires. Assessment of the wheels and tires were limited due to the nonavailability of data on these parts. Twenty-five PCIs were identified. These items are listed in Appendix D.

4.3 Analysis Results B&AS.

The B&AS consists of the Rudder/Brake Pedal Assembly, the Brakes, the Brake Control System, and the Antiskid Control System. Only seven PCI items were identified due primarily to the nonavailability of data on the hardware that was being assessed. The PCIs are listed in Appendix D.

4.4 Analysis Results EPD&C.

EPD&C provides power to the Landing Gear Control subsystem, Brake and Antiskid subsystem, and to sensing and monitoring functions within the Landing/Deceleration subsystem. Thirty-eight PCIs were identified and are listed in Appendix D.

4.5 Analysis Results NWS.

The analysis for the Landing and Deceleration, NWS, was performed by a separate working group that was established to align with the NASA alignment. Their report is separate and will not be incorporated with this report. The reason for the mention of their report is that the NSTS 82-0013 document included the FMEA reports for the NWS. The mechanical hardware required by the NWS is included in the NLG portion of this report.

4.6 Analysis Results HYD.

The hydraulics subsystem is the primary system supporting the six hydraulic actuators responsible for deploying the landing gear and for providing pressure to operate the orbiters brakes. Twenty-six PCIs were identified; all are listed in Appendix D.

5.0 REFERENCES

Reference documentation available from NASA and Rockwell was used in the analysis. The documentation used included the following:

1. AD HOC COMMITTEE - ORBITER BRAKING SYSTEM ASSESSMENT - Volume I, Data Book, January 1984.
2. AD HOC COMMITTEE - ORBITER BRAKING SYSTEM ASSESSMENT - Volume II, Assessment, March 1984.
3. AD HOC COMMITTEE - ORBITER BRAKING SYSTEM ASSESSMENT - Volume III, Interim Review, July 1985.
4. THIRD AD HOC COMMITTEE MEETING - ORBITER BRAKE DEVELOPMENT - July 1986.
5. JSC-12770 Shuttle Flight Operations Manual - Volume 10D. Preliminary, 15-12-78.
6. JSC-18341 Mechanical Systems Console Handbook - Volume II Systems Briefs, Basic, Revision A, PCN-3, 07-02-86.
7. NSTS-22206 Instructions For Preparation Of Failure Modes And Effects Analysis (FMEA) And Critical Items List (CIL), 10 October 1986.
8. MC197-0007 Rockwell Procurement Specification, Tires - Orbiter, 22 February 1984.
9. MC325-0006 Rockwell Procurement Specification, Thruster Assembly, Pyrotechnic, Emergency Nose Gear Uplock Release, 29 February 1984.
10. MC325-0019 Rockwell Procurement Specification, Thruster Assembly, Main Landing Gear - Gear Uplock Release, 6 June 1986.
11. MC621-0011 Rockwell Procurement Specification, Shock Strut Assembly - Main Landing Gear - Orbiter, 8 July 1985.
12. MC621-0012 Rockwell Procurement Specification, Shock Strut Assembly - Nose Landing Gear - Orbiter, 7 May 1981.
13. MC621-0043 Rockwell Procurement Specification, Space Shuttle Flight Control Subsystem, 4 October 1985.
14. MC621-0050 Rockwell Procurement Specification, Wheel Assembly, Nose Landing Gear - Orbiter, 30 March 1984.
15. MC621-0051 Rockwell Procurement Specification, Wheel and Brake Assembly - Main Landing Gear - Orbiter, 21 February 1986.

16. MC621-0055 Rockwell Procurement Specification, Brake/Skid Control Subsystem, Wheel Brakes - Main Landing Gear - Orbiter, 13 January 1986.
17. MC621-0058 Rockwell Procurement Specification, Steering and Damping Subsystem - Nose Landing Gear, 24 October 1985.
18. VO70-510001 Main Landing Gear - Installation. Revision B-13, 28 July 1986.
19. VO70-510101 Booster Assembly, Door Extension - Main Landing Gear. Revision B-08, 10 December 1985.
20. VO70-510201 Mechanical Installation - Main Landing Gear. Revision D-10, 8 July 1986.
21. VO70-510202 Assembly of the Uplock Arm - Main Landing Gear. Revision ?, 10 September 1974.
22. VO70-510300 Fitting Installation - Main Landing Gear. Revision C-05, 1 March 1984.
23. VO70-510301 Uplock Assembly - Main Landing Gear. Revision C-10, 30 November 1984.
24. VO70-510302 Fitting, Uplock, Assembly of, Main Landing Gear. Revision C-06, 20 September 1985.
25. VO70-510346 Hook, Center Door - Assembly of, Main Landing Gear. Revision B, 1 August 1978.
26. VO70-510400 Hook - Door, Assembly of, Main Landing Gear. Revision ?, 5 November 1980.
27. VO70-510476 Fitting, Inboard Trunion, Assembly of, Main Landing gear. Revision ?, 26 April 1986.
28. VO70-510501 Installation - Nose Landing Gear. Revision C-05, 30 July 1986.
29. VO70-510502 Chassis Assembly - Nose Landing Gear. Revision E-09, 29 July 1986.
30. VO70-510550 Uplock Assembly - Nose Landing Gear. Revision B-10, 7 November 1985.
31. VO70-510601 Doors and Mechanical Installation - Nose Landing Gear. Revision E-24, 19 February 1985.
32. VO70-510711 Lock Assembly - Aft Door, Nose Landing Gear. Revision A-03, 9 February 1978.

33. VO70-510751 Bungee Assembly - Thruster, Nose Landing Gear. Revision B-05, 12 February 1982.
34. VO70-552001 Cartridge Installation - Nose Landing Gear Thrusters.
35. VO70-573001 Mechanical Installation - Yaw & Brake Control Pedals. Revision C-11, 25 October 1985.
36. VS70-510109 Schematic Diagram - Landing Gear Control Subsystem. Revision E-01, 6 June 1983.
37. VS70-510209 Schematic Diagram - Nose Wheel Steering Subsystem. Revision F-01, 23 August 1985.
38. VS70-520109 Schematic Diagram - Brake and Skid Control Subsystem. Revision E-01, 22 August 1985.
39. VS70-790149 Schematic Diagram - Rudder Pedal Transducer Assembly - Flight Control Subsystem. Revision ?, 1 December 1984.
40. 1170100 MENASCO - Shock Strut Assembly - Main Landing Gear - Orbiter. Revision 2-H, Date Unreadable.
41. 1170101 MENASCO - Cylinder Assembly, Shock Strut - Main Landing Gear - Orbiter. Revision D, Date Unreadable.
42. 1170114 MENASCO - Pin Meetering, Shock Strut - Main Landing Gear - Orbiter. Revision C, Date Unreadable.
43. 1170182 MENASCO - Axle Assembly, Shock Strut - Main Landing Gear - Orbiter. Revision A. 7 November 1984. (Reference Only)
44. 1170300 MENASCO - Drag Brace Assembly - Main Landing Gear - Orbiter. Revision D, Date Unreadable.
45. 1170301 MENASCO - Drag Brace Assembly - Lower - Main Landing Gear - Orbiter. Revision A, Date Unreadable.
46. 1170350 MENASCO - Lock Brace Assembly - Main Landing Gear - Orbiter. Revision E, 20 July 1976.
47. 1170493 MENASCO - Layout - Shock Strut - Main Landing Gear - Orbiter. Revision F, Date Unreadable.
48. Landing/Deceleration - LDG/DECEL 2102 - Training Document. 22-02-83
49. MC287-0034 Rockwell Procurement Specification, Actuator Strut, Landing Gear, Hydraulic. Revision H-6, 1 August 1983.

50. VS70-958102 Integrated System Schematic - Hydraulics
Subsystem. Revision F-10, 23 April 1986

APPENDIX A ACRONYMS

AOA	- Abort-Once-Around
ATO	- Abort-To-Orbit
B&AS	- Brakes and Antiskid
BFC	- Backup Flight Control
BFS	- Backup Flight System
BITE	- Built-In Test Equipment
C&W	- Caution and Warning
CIL	- Critical Items List
CPU	- Central Processing Unit
CRT	- Cathode-Ray Tube
D/A	- Digital to Analog
DPS	- Data Processing System (Subsystem)
EPDC	- Electrical Power Distribution and Control
EVA	- Extravehicular Activity
FMEA	- Failure Modes and Effects Analysis
GFE	- Government Furnished Equipment
GPC	- General Purpose Computer
GSE	- Ground Support Equipment
HDC	- Hybrid Driver Controller
HYD	- Hydraulics
IOA	- Independent Orbiter Assessment
LCA	- Load Controller Assembly
LNDRG/DECEL	- Landing and Deceleration
LVDT	- Linear Variable Differential Transformer
MDAC	- McDonnell Douglas Astronautics Company
MGSSA	- Main Gear Shock Strut Assembly
MLG	- Main Landing Gear
NA	- Not Applicable
NASA	- National Aeronautics and Space Administration
NGSSA	- Nose Landing Gear Shock Strut Assembly
NLG	- Nose Landing Gear
NSTS	- National Space Transportation System
NWS	- Nose-Wheel Steering
OMRSD	- Operational Maintenance Requirements and Specifications Document
OPS	- Operations Sequence
PCA	- Power Control Assembly
PCI	- Potential Critical Item
PIC	- Pyro Initiator Controller
R/BPA	- Rudder/Pedal Brake Assembly
REG	- Regulate, Regulator
RI	- Rockwell International
RPTA	- Rudder Pedal Transducer Assembly
RTLS	- Return-to-Landing Site
SFTWE	- Software
STS	- Space Transportation System
TAL	- Transatlantic Abort Landing
TD	- Touch Down
THC	- Thruster Hand Controller

VAC	- Volts, ac
VDC	- Volts, dc
WONG	- Weight on Nose Gear
WOW	- Weight on Wheels

APPENDIX B

DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

- B.1 Definitions
- B.2 Project Level Ground Rules and Assumptions
- B.3 Subsystem-Specific Ground Rules and Assumptions

APPENDIX B
DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.1 Definitions

Definitions contained in NSTS 22206, Instructions For Preparation of FMEA/CIL, 10 October 1986, were used with the following amplifications and additions.

INTACT ABORT DEFINITIONS:

RTLS - begins at transition to OPS 6 and ends at transition to OPS 9, post-flight

TAL - begins at declaration of the abort and ends at transition to OPS 9, post-flight

AOA - begins at declaration of the abort and ends at transition to OPS 9, post-flight

ATO - begins at declaration of the abort and ends at transition to OPS 9, post-flight

CREDIBLE (CAUSE) - an event that can be predicted or expected in anticipated operational environmental conditions. Excludes an event where multiple failures must first occur to result in environmental extremes

CONTINGENCY CREW PROCEDURES - procedures that are utilized beyond the standard malfunction procedures, pocket checklists, and cue cards

EARLY MISSION TERMINATION - termination of onorbit phase prior to planned end of mission

EFFECTS/RATIONALE - description of the case which generated the highest criticality

HIGHEST CRITICALITY - the highest functional criticality determined in the phase-by-phase analysis

MAJOR MODE (MM) - major sub-mode of software operational sequence (OPS)

MC - Memory Configuration of Primary Avionics Software System (PASS)

MISSION - assigned performance of a specific Orbiter flight with payload/objective accomplishments including orbit phasing and altitude (excludes secondary payloads such as GAS cans, middeck P/L, etc.)

MULTIPLE ORDER FAILURE - describes the failure due to a single cause or event of all units which perform a necessary (critical) function

OFF-NOMINAL CREW PROCEDURES - procedures that are utilized beyond the standard malfunction procedures, pocket checklists, and cue cards

OPS - software operational sequence

PRIMARY MISSION OBJECTIVES - worst case primary mission objectives are equal to mission objectives

PHASE DEFINITIONS:

PRELAUNCH PHASE - begins at launch count-down Orbiter power-up and ends at moding to OPS Major Mode 102 (liftoff)

LIFTOFF MISSION PHASE - begins at SRB ignition (MM 102) and ends at transition out of OPS 1 (Synonymous with ASCENT)

ONORBIT PHASE - begins at transition to OPS 2 or OPS 8 and ends at transition out of OPS 2 or OPS 8

DEORBIT PHASE - begins at transition to OPS Major Mode 301 and ends at first main landing gear touchdown

LANDING/SAFING PHASE - begins at first main gear touchdown and ends with the completion of post-landing safing operations

APPENDIX B
DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.2 IOA Project Level Ground Rules and Assumptions

The philosophy embodied in NSTS 22206, Instructions for Preparation of FMEA/CIL, 10 October 1986, was employed with the following amplifications and additions.

1. The operational flight software is an accurate implementation of the Flight System Software Requirements (FSSRs).

RATIONALE: Software verification is out-of-scope of this task.

2. After liftoff, any parameter which is monitored by system management (SM) or which drives any part of the Caution and Warning System (C&W) will support passage of Redundancy Screen B for its corresponding hardware item.

RATIONALE: Analysis of on-board parameter availability and/or the actual monitoring by the crew is beyond the scope of this task.

3. Any data employed with flight software is assumed to be functional for the specific vehicle and specific mission being flown.

RATIONALE: Mission data verification is out-of-scope of this task.

4. All hardware (including firmware) is manufactured and assembled to the design specifications/drawings.

RATIONALE: Acceptance and verification testing is designed to detect and identify problems before the item is approved for use.

5. All Flight Data File crew procedures will be assumed performed as written, and will not include human error in their performance.

RATIONALE: Failures caused by human operational error are out-of-scope of this task.

6. All hardware analyses will, as a minimum, be performed at the level of analysis existent within NASA/Prime Contractor Orbiter FMEA/CILs, and will be permitted to go to greater hardware detail levels but not lesser.

RATIONALE: Comparison of IOA analysis results with other analyses requires that both analyses be performed to a comparable level of detail.

7. Verification that a telemetry parameter is actually monitored during AOS by ground-based personnel is not required.

RATIONALE: Analysis of mission-dependent telemetry availability and/or the actual monitoring of applicable data by ground-based personnel is beyond the scope of this task.

8. The determination of criticalities per phase is based on the worst case effect of a failure for the phase being analyzed. The failure can occur in the phase being analyzed or in any previous phase, whichever produces the worst case effects for the phase of interest.

RATIONALE: Assigning phase criticalities ensures a thorough and complete analysis.

9. Analysis of wire harnesses, cables, and electrical connectors to determine if FMEAs are warranted will not be performed nor FMEAs assessed.

RATIONALE: Analysis was substantially complete prior to NSTS 22206 ground rule redirection.

10. Analysis of welds or brazed joints that cannot be inspected will not be performed nor FMEAs assessed.

RATIONALE: Analysis was substantially complete prior to NSTS 22206 ground rule redirection.

11. Emergency system or hardware will include burst discs and will exclude the EMU Secondary Oxygen Pack (SOP), pressure relief valves and the landing gear pyrotechnics.

RATIONALE: Clarify definition of emergency systems to ensure consistency throughout IOA project.

APPENDIX B
DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.3 Landing/Deceleration - Specific Ground Rules and Assumptions

The IOA analysis was performed to the assembly or component level in the Landing/Deceleration Subsystem. The analysis considered the worst case effects of the hardware and the functional failures of the subsystem and their impacts on the mission and crew and vehicle safety.

1. Pyrotechnic devices were not considered as emergency devices that were to be used in contingency operations.

RATIONALE: The NLG Extension Booster Pyro Actuator functions every time that the NLG is operated to insure that the system is able to overcome any wind forces that are acting on the landing gear doors.

RATIONALE: The Backup Pyro Uplock Release Actuator is a backup or redundant actuator that operates one second after the deploy command is issued if it does not receive a signal that the Uplock Release Hook has functioned properly.

2. The Landing/Deceleration Subsystem considers that all ABORT MODES will be terminated post landing at the time of vehicle egress.

RATIONALE: Under the IOA specific rules an abort would fall under two definitions, deorbit and landing, the intent of this subsystem rule is to simplify the abort analysis.

3. Component age life will not be considered in the analysis.

RATIONALE: Component age analysis is beyond the scope of this task.

APPENDIX C
DETAILED ANALYSIS

This section contains the IOA analysis worksheets generated during the analysis of this subsystem. The information on these worksheets is intentionally similar to the NASA FMEAs. Each of these sheets identifies the hardware item being analyzed, and the parent assembly, as well as the function. For each failure mode, the possible causes are outlined, and the assessed hardware and functional criticality for each mission phase is listed, as described in the NSTS 22206, Instructions for Preparation of FMEA and CIL, 10 October 1986. Finally, effects are entered at the bottom of each sheet, and the worst case criticality is entered at the top.

LEGEND FOR IOA ANALYSIS WORKSHEETS

Hardware Criticalities:

- 1 = Loss of life or vehicle
- 2 = Loss of mission or next failure of any redundant item (like or unlike) could cause loss of life/vehicle
- 3 = All others

Functional Criticalities:

- 1R = Redundant hardware items (like or unlike) all of which, if failed, could cause loss of life or vehicle.
- 2R = Redundant hardware items (like or unlike) all of which, if failed, could cause loss of mission.

Redundancy Screen A:

- 1 = Is Checked Out PreFlight
- 2 = Is Capable of Check Out PreFlight
- 3 = Not Capable of Check Out PreFlight
- NA = Not Applicable

Redundancy Screens B and C:

- P = Passed Screen
- F = Failed Screen
- NA = Not Applicable

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10101 ABORT: 1/1

ITEM: TIRES, NLG TYPE II
FAILURE MODE: RUPTURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR - TIRES
- 2) TIRES
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	3/3	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 006-836 B. F. GOODRICH, MC194-0007-0002

CAUSES: OVERLOAD, CUTS, CONSTRUCTION FLAWS

EFFECTS/RATIONALE:

A RUPTURE OF A NOSE LANDING GEAR TIRE ON TOUCHDOWN WOULD PLACE TORQUE ON THE NOSE LANDING GEAR STRUT WHICH WOULD CAUSE THE AXLE TO ROTATE. THE SIDE LOADING ON THE SINGLE TIRE THAT REMAINS PLUS THE WEIGHT OF THE NOSE ON THE SINGLE TIRE WOULD CAUSE THE SECOND TIRE TO FAIL. OTHER COMPLICATIONS THAT COULD OCCUR INCLUDE FRACTURING THE AXLE, BREAKING THE STEERING COLLAR, SHEARING THE NOSE WHEEL STEERING ATTACH POINTS, AND OVERLOADING THE TORQUE ARM.

REFERENCES: MC194-0007 - THE ONLY DOCUMENT AVAILABLE FOR THE EVALUATION IS THE PROCUREMENT SPECIFICATION.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10201 ABORT: 1/1

ITEM: NOSE LANDING GEAR TRUNION
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) SHOCK STRUT ATTACHING TRUNIONS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170623 MENASCO, V070-782214 (001/002)

CAUSES: MECHANICAL SHOCK, OVERLOAD, MISHANDLING OR ABUSE, PIECE
PART STRUCTURAL FAILURE - CORROSION - CRACKING

EFFECTS/RATIONALE:

THE STRUCTURAL FAILURE OF ONE OR BOTH OF THE SHOCK STRUT TRUNIONS
WOULD RESULT IN A COLLAPSE OF THE NOSE LANDING GEAR. A FAILURE
AT TOUCHDOWN COULD RESULT IN THE LOSS OF THE CREW AND THE
VEHICLE.

REFERENCES: MC621-0012, V070-510501, V070-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10202 ABORT: 1/1

ITEM: DRAG BRACE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) LOWER DRAG BRACE STRUT
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170801-1 MENASCO (LOWER DRAG BRACE), MC621-0012-0003

CAUSES: PIECE-PART STRUCTURAL FAILURE - CRACKING - MECHANICAL
SHOCK, MISHANDLING OR ABUSE, OVERLOAD.

EFFECTS/RATIONALE:
A LOWER DRAG BRACE FAILURE WOULD CAUSE AN IMMEDIATE COLLAPSE OF THE NOSE LANDING GEAR THAT WOULD ALLOW THE NOSE OF THE ORBITER TO IMPACT THE RUNWAY SURFACE. A FAILURE OF THIS NATURE WOULD RESULT IN THE LOSS OF THE CREW AND THE VEHICLE.

REFERENCES: MC621-0012, VO70-510501, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10203 ABORT: 1/1

ITEM: DRAG BRACE TRUNION
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) DRAG BRACE TRUNION (AT LOCK BRACE)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170804 MENASCO (AT LOCK BRACE)

CAUSES: PIECE-PART STRUCTURAL FAILURE - CRACKING - MECHANICAL
SHOCK, MISHANDLING OR ABUSE, OVERLOAD.

EFFECTS/RATIONALE:

A LOSS OF THIS TRUNION AT TOUCHDOWN WOULD CAUSE A COLLAPSE OF THE
NOSE LANDING GEAR. THE LOSS OF THE CREW AND THE VEHICLE WOULD BE
A PROBABLE RESULT OF A FAILURE OF THIS NATURE.

REFERENCES: MC621-0012, VO70-510501, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10204 ABORT: 1/1

ITEM: LOCK BRACE ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) LOCK BRACE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170850-503 MENASCO, MC621-0012-0006

CAUSES: PIECE-PART STRUCTURAL FAILURE , MISHANDLING OR ABUSE.

EFFECTS/RATIONALE:

A STRUCTURAL FAILURE OF THE LOCK BRACE ASSEMBLY WOULD ALLOW THE NOSE LANDING GEAR TO COLLAPSE AT TOUCHDOWN. A FAILURE OF THIS NATURE WOULD CAUSE A LOSS OF THE CREW AND THE VEHICLE.

REFERENCES: MC621-0012, VO70-510501, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10205 ABORT: 1/1

ITEM: DOWNLOCK BUNGEE
FAILURE MODE: PHYSICAL BINDING / JAMMING

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) LOCK BRACE ASSEMBLY
- 4) DOWN LOCK BUNGEE
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170683-101 MENASCO

CAUSES: PIECE-PART STRUCTURAL FAILURE , MISHANDLING OR ABUSE.

EFFECTS/RATIONALE:

IF THE BUNGEE IS NOT FUNCTIONING AS REQUIRED THE NOSE LANDING GEAR DOWNLOCK WILL BE SECURED BY HYDRAULICS SYSTEM 1 ONLY. A FAILURE OF THE HYDRAULICS WOULD ALLOW THE NOSE LANDING GEAR TO COLLAPSE AT TOUCHDOWN. FOLLOWING NORMAL SHUT-DOWN AND EGRESS THE HYDRAULICS SYSTEM WILL BE TURNED OFF BEFORE EGRESS. WHEN THE HYDRAULICS NO LONGER PROVIDES THE HOLDING POWER, THE NOSE LANDING GEAR COULD COLLAPSE CAUSING A LOSS OF THE VEHICLE AND POSSIBLY PERSONNEL UNDER OR IN THE VEHICLE.

REFERENCES: MC621-0012, VO70-510501, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10206 ABORT: 1/1

ITEM: DOWNLOCK BUNGEE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) LOCK BRACE ASSEMBLY
- 4) DOWN LOCK BUNGEE
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170683-101 MENASCO

CAUSES: PIECE-PART STRUCTURAL FAILURE , MISHANDLING OR ABUSE.

EFFECTS/RATIONALE:

IF THE BUNGEE IS NOT FUNCTIONING AS REQUIRED THE NOSE LANDING GEAR DOWNLOCK WILL BE SECURED BY HYDRAULICS SYSTEM 1 ONLY. A FAILURE OF THE HYDRAULICS WOULD ALLOW THE NOSE LANDING GEAR TO COLLAPSE AT TOUCHDOWN. FOLLOWING NORMAL SHUT-DOWN AND EGRESS THE HYDRAULICS SYSTEM WILL BE TURNED OFF BEFORE EGRESS. WHEN THE HYDRAULICS NO LONGER PROVIDES THE HOLDING POWER, THE NOSE LANDING GEAR COULD COLLAPSE CAUSING A LOSS OF THE VEHICLE AND POSSIBLY PERSONNEL UNDER OR IN THE VEHICLE.

REFERENCES: MC621-0012, VO70-510501, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10207 ABORT: 3/3

ITEM: NLG - DOWN AND LOCK SENSOR
FAILURE MODE: SHORTED - OPEN / CLOSED

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) TORQUE TUBE ASSEMBLY
- 4) NOSE LANDING GEAR - DOWN AND LOCK SENSOR
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: VO70-510340

CAUSES: CORROSION, VIBRATION, LOOSE CONNECTION, WORN OR DAMMAGED WIRES

EFFECTS/RATIONALE:

THE SIGNAL IS NOT ACTIVATED UNTIL THE ARM ON THE TORQUE TUBE ASSEMBLY CONTACTS THE ELECTRICAL SENSOR. THE SENSOR SENDS THE SIGNAL OF GEAR DOWN AND LOCKED TO THE NOSE LANDING GEAR INDICATOR. IF THE NOSE LANDING GEAR HAS NOT BEEN DEPLOYED AND THE SENSOR IS SHORTED OPEN THE SIGNAL IN THE COCKPIT WILL SHOW BARBERPOLE, IF THE SENSOR IS SHORTED CLOSED AN ERRONEOUS DOWN AND LOCKED SIGNAL WILL BE SENT.

REFERENCES: MC621-0012, VO70-510501, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10208 ABORT: 3/3

ITEM: NLG - DOWN AND LOCK SENSOR
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) TORQUE TUBE ASSEMBLY
- 4) NOSE LANDING GEAR - DOWN AND LOCK SENSOR
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: VO70-510340

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK.

EFFECTS/RATIONALE:

THE SIGNAL IS NOT ACTIVATED UNTIL THE ARM ON THE TORQUE TUBE
ASSEMBLY CONTACTS THE ELECTRICAL SENSOR. IF THE ARM IS BROKEN
OR DAMAGED NO CONTACT WILL BE MADE AND THERE WILL BE A LOSS OF
INPUT.

REFERENCES: MC621-0012, VO70-510501, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 10209 ABORT: 3/1R

ITEM: STEERING COLLAR ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) NOSE WHEEL STEERING ASSEMBLY
- 4) STEERING COLLAR ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/3	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/3
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170604-101 MENASCO, MC621-0012

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK.

EFFECTS/RATIONALE:

THE IMMEDIATE LOSSES WILL BE THE LOSS OF NOSE WHEEL STEERING AND
THE LOSS OF NOSE WHEEL DAMPING.

REFERENCES: MC621-0012, VO70-510501, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10210 ABORT: 1/1

ITEM: STEERING DISCONNECT LOCK
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) NOSE WHEEL STEERING ASSEMBLY
- 4) TORQUE ARM ASSEMBLY
- 5) STEERING DISCONNECT LOCK
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170622-101 MENASCO, 1170640-101 MENASCO

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK, VIBRATION.

EFFECTS/RATIONALE:

IF THE STEERING DISCONNECT LOCK MALFUNCTIONS AND THE TORQUE ARMS
SEPARATE, THE NOSE WHEEL WILL BE CAPABLE OF CASTERING 360
DEGREES. IF THE NOSE WHEEL ROTATES BEYOND THE SAFE RANGE BEFORE
TOUCHDOWN THE NOSE LANDING GEAR WILL COLLAPSE.

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10211 ABORT: 1/1

ITEM: TORQUE ARM ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) NOSE WHEEL STEERING ASSEMBLY
- 4) TORQUE ARM ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC621-0012, 1170605 MENASCO, 1170629 MENASCO

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK.

EFFECTS/RATIONALE:

A STRUCTURAL FAILURE OF THE TORQUE ARM ASSEMBLY AT THE NOSE
LANDING GEAR SLAPDOWN COULD CAUSE A NOSE WHEEL ROTATION BEYOND
THE SAFE RANGE RESULTING IN A NOSE LANDING GEAR COLLAPSE.
PROBABLE LOSS OF CREW AND VEHICLE.

RATIONALE: THE NOSE WHEEL IS DESIGNED TO BE ABLE TO ROTATE 360
DEGREES IF IT IS NOT RESTRICTED BY THE TORQUE ARM ASSEMBLY.

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10212 ABORT: 1/1

ITEM: NOSE WHEEL RETAINING BOLT
FAILURE MODE: CORROSION, STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) AXLE ASSEMBLY
- 4) NOSE WHEEL RETAINING BOLT
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	1/1
LIFTOFF:	3/3		TAL:	1/1
ONORBIT:	3/3		AOA:	1/1
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	1/1			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: NAS1004-6, MC621-0012

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK.

EFFECTS/RATIONALE:

A FAILURE OF THE BOLT COULD CAUSE SEPARATION OF ONE OF THE NOSE
WHEELS AT OR SHORTLY AFTER TOUCHDOWN, CAUSING PROBABLE LOSS OF
THE VEHICLE AND THE CREW.

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10213 ABORT: 1/1

ITEM: AXLE
FAILURE MODE: CORROSION, STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) AXLE ASSEMBLY
- 4) AXLE
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170631-1 MENASCO, MC621-0012-0001

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK.

EFFECTS/RATIONALE:

A HARD NOSE WHEEL SLAPDOWN COULD CAUSE THE STRUCTURAL FAILURE OF
THE AXLE

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10214 ABORT: 3/3

ITEM: WEIGHT ON WHEELS SENSORS - NLG
FAILURE MODE: ERONEOUS OUTPUT

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) WEIGHT ON WHEELS SENSOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: NOSE LANDING GEAR
PART NUMBER: VO70-510340

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK.

EFFECTS/RATIONALE:

SIGNAL APPEARS EARLY OR INTERMITTENTLY GIVING SIGNALS TO THE NOSE
WHEEL STEERING THAT COULD CANCEL THE STEERING CAPABILITY

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10215 ABORT: 1/1

ITEM: SHOCK STRUT
FAILURE MODE: INTERNAL / EXTERNAL LEAKAGE (HYDRAULIC FLUID)

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) SHOCK STRUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170600-507 MENASCO, MC621-0012-0008

CAUSES: SEAL FAILURE, MISHANDLING OR ABUSE

EFFECTS/RATIONALE:

COLLAPSE OF SHOCK STRUT DURING LANDING CAUSING MECHANICAL SHOCK TO SHOCK STRUT UPPER STRUCTURE AND TRUNIONS RESULTING IN NOSE LANDING GEAR COLLAPSE AT LANDING. A LOSS OF THE CREW AND THE VEHICLE WOULD BE PROBABLE.

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 10216 ABORT: 3/1R

ITEM: SHOCK STRUT
FAILURE MODE: INTERNAL / EXTERNAL LEAKAGE (NITROGEN)

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) SHOCK STRUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/3	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170600-507 MENASCO, MC621-0012-0008

CAUSES: SEAL FAILURE, MISHANDLING OR ABUSE

EFFECTS/RATIONALE:

PARTIAL LOSS OF EFFECTIVENESS. THE LOSS OF NITROGEN PRESSURE IN THE SHOCK STRUT ASSEMBLY WOULD NOT PREVENT THE FUNCTIONING OF THE HYDRAULIC PORTION OF THE SHOCK STRUT. THE SHOCK DESIGN SPECIFICATION REQUIRES A SAFETY FACTOR THAT WILL ALLOW A LANDING WITH ONE ATMOSPHERE OF NITROGEN PRESSURE IN THE SHOCK STRUT.

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10217 ABORT: 1/1

ITEM: UPLOCK ROLLER RETAINING ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) UPLOCK ROLLER RETAINING ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	1/1	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC621-0012, VO70-510550, 1170666 MENASCO

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION

EFFECTS/RATIONALE:

THE NOSE LANDING GEAR WOULD NOT LOCK IN POSITION AND THE SHOCK STRUT ASSEMBLY AND ITS ATTACHMENTS WOULD BE LOOSE IN THE NOSE WHEEL AREA. THE WEIGHT OF THE NOSE LANDING GEAR AGAINST THE DOOR COULD CAUSE AN INADVERTANT LANDING GEAR DEPLOY DURING LAUNCH OR DURING DEORBIT

REFERENCES: VO70-510550

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10217 ABORT: 1/1

ITEM: UPLOCK ROLLER RETAINING ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) UPLOCK ROLLER RETAINING ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	1/1
LIFTOFF:	1/1		TAL:	1/1
ONORBIT:	3/3		AOA:	1/1
DEORBIT:	1/1		ATO:	1/1
LANDING/SAFING:	1/1			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC621-0012, VO70-510550, 1170666 MENASCO

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION

EFFECTS/RATIONALE:

THE NOSE LANDING GEAR WOULD NOT LOCK IN POSITION AND THE SHOCK STRUT ASSEMBLY AND ITS ATTACHMENTS WOULD BE LOOSE IN THE NOSE WHEEL AREA. THE WEIGHT OF THE NOSE LANDING GEAR AGAINST THE DOOR COULD CAUSE AN INADVERTANT LANDING GEAR DEPLOY DURING LAUNCH OR DURING DEORBIT

REFERENCES: VO70-510550

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10218 ABORT: 3/3

ITEM: WEIGHT ON WHEELS SENSORS - NLG
FAILURE MODE: SHORTED CLOSED

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) WEIGHT ON WHEELS SENSOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: NOSE LANDING GEAR
PART NUMBER: VO70-510340

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK.

EFFECTS/RATIONALE:

THERE WOULD BE NO SIGNAL CHANGE AFTER NLG SLAPDOWN. THE SIGNAL
IS ONE OF THREE THAT IS REQUIRED TO ACTIVATE THE NOSE WHEEL
STEERING. NWS CAPABILITIES COULD BE LOST.

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10219 ABORT: 3/3

ITEM: WEIGHT ON WHEELS SENSORS - NLG
FAILURE MODE: SHORTED OPEN

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) WEIGHT ON WHEELS SENSOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	3/3		TAL:	3/3
ONORBIT:	3/3		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: NOSE LANDING GEAR
PART NUMBER: VO70-510340

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK.

EFFECTS/RATIONALE:

THERE WOULD BE A CONSTANT ERRONEOUS SIGNAL TO THE NWS WHICH COULD
CAUSE THE LOSS OF THE NWS CAPABILITY.

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10220 ABORT: 1/1

ITEM: TORQUE TUBE ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) TORQUE TUBE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	1/1
LIFTOFF:	3/3		TAL:	1/1
ONORBIT:	3/3		AOA:	1/1
DEORBIT:	1/1		ATO:	1/1
LANDING/SAFING:	1/1			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170583-101 MENASCO, MC621-0012

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION

EFFECTS/RATIONALE:

THE LOSS OF THE TORQUE TUBE ASSEMBLY WOULD CAUSE POSSIBLE PROBLEMS WITH THE DEPLOY OF THE NOSE LANDING GEAR. IF BROKEN, PROBLEMS WILL BE ENCOUNTERED WITH THE HYDRAULIC EXTENSION OF THE NLG AND THE NLG LOCKDOWN. IF THE ASSEMBLY SEPARATES THE NLG WILL COLLAPSE AT NLG SLAPDOWN CAUSING A PROBABLE LOSS OF THE CREW AND THE VEHICLE.

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10221 ABORT: 1/1

ITEM: DRAG BRACE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) UPPER DRAG BRACE STRUT (YOKE ASSEMBLY)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170802-1 MENASCO, MC621-0012-0003

CAUSES: PIECE-PART STRUCTURAL FAILURE - CRACKING - MECHANICAL
SHOCK, MISHANDLING OR ABUSE, OVERLOAD.

EFFECTS/RATIONALE:

A FAILURE OF ONE OR BOTH OF THE ARMS OF THE UPPER YOKE ASSEMBLY
OF THE DRAG BRACE COULD CAUSE THE COLLAPSE OF THE NOSE LANDING
GEAR. A LOSS OF THE CREW AND THE VEHICLE WOULD BE POSSIBLE WITH
A FAILURE OF THIS NATURE.

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10222 ABORT: 1/1

ITEM: DRAG BRACE TRUNION
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) DRAG BRACE TRUNION (AT SHOCK STRUT)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC621-0012-0003, 1170632-1 MENASCO, 1170358-1
MENASCO (2EA)

CAUSES: PIECE-PART STRUCTURAL FAILURE - CRACKING - MECHANICAL
SHOCK, MISHANDLING OR ABUSE, OVERLOAD.

EFFECTS/RATIONALE:

A LOSS OF THIS TRUNION AT TOUCHDOWN WOULD CAUSE A COLLAPSE OF THE
NOSE LANDING GEAR. THE LOSS OF THE CREW AND THE VEHICLE WOULD BE
A PROBABLE RESULT OF A FAILURE OF THIS NATURE.

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10223 ABORT: 1/1

ITEM: DRAG BRACE TRUNION
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) DRAG BRACE TRUNION (AT VEHICLE ATTACH POINT)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: 1170806 MENASCO (AT VEHICLE ATTACH POINT), MC621-0012-0003

CAUSES: PIECE-PART STRUCTURAL FAILURE - CRACKING - MECHANICAL SHOCK, MISHANDLING OR ABUSE, OVERLOAD.

EFFECTS/RATIONALE:

THE LOSS OF EITHER OF THE UPPER TRUNIONS COULD CAUSE THE FAILURE AND SUBSEQUENT COLLAPSE OF THE NOSE LANDING GEAR. A LOSS OF THE VEHICLE AND CREW WOULD BE A PROBABLE RESULT OF A FAILURE OF THIS NATURE.

REFERENCES: MC621-0012, VO70-510502

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10224 ABORT: 1/1

ITEM: SUPPORT BEAM
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) SUPPORT BEAM
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC	
PRELAUNCH:	3/3	RTLS:	1/1	
LIFTOFF:	3/3	TAL:	1/1	
ONORBIT:	3/3	AOA:	1/1	
DEORBIT:	1/1	ATO:	1/1	
LANDING/SAFING:	1/1			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC621-0012-0003, 1170803-1 MENASCO

CAUSES: OVERLOAD, CORROSION / CRACKING, PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, MISHANDLING OR ABUSE

EFFECTS/RATIONALE:

A STRUCTURAL FAILURE OF THE SUPPORT BEAM WOULD CAUSE TORSION ON THE DRAG BRACE ASSEMBLY THAT COULD CAUSE THE UPPER DRAG BRACE TRUNIONS TO FRACTURE DUE TO TORSION. A FAILURE OF THIS NATURE WOULD RESULT IN THE LOSS OF THE VEHICLE AND THE CREW.

REFERENCES: MC621-0012

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10401 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: BROKEN ROD / LINKAGE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC	
PRELAUNCH:	3/3	RTLS:	3/3	
LIFTOFF:	3/3	TAL:	3/3	
ONORBIT:	3/3	AOA:	3/3	
DEORBIT:	3/3	ATO:	3/3	
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: STRESS / FRACTURE, MISHANDLING OR ABUSE

EFFECTS/RATIONALE:

THE LANDING GEAR WILL NOT EXTEND OR RETRACT HYDRAULICALLY.
GRAVITY AND AIRFLOW WILL EXTEND THE LANDING GEAR.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 10402 ABORT: 2/1R

ITEM: NLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: LEAK, EXTERNAL

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	2/1R
LIFTOFF:	3/3		TAL:	2/1R
ONORBIT:	3/3		AOA:	2/1R
DEORBIT:	3/3		ATO:	2/1R
LANDING/SAFING:	2/1R			

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: O-RING SEALS, VIBRATION, LOOSE BOLTS

EFFECTS/RATIONALE:

POSSIBLE LOSS OF HYDRAULICS SYSTEM 1 AND THE LANDING GEAR WILL NOT EXTEND OR RETRACT HYDRAULICALLY. THE LANDING GEAR WILL EXTEND BY GRAVITY AND AIRFLOW WITH THE ASSIST OF THE NOSE LANDING GEAR EXTENSION BOOSTER PYRO ACTUATOR.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10403 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: LEAK, INTERNAL PISTON

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: SEAL DAMAGE, MISHANDLING OR ABUSE

EFFECTS/RATIONALE:
THE HYDRAULIC PUMP WILL COMPENSATE FOR THE LOSS OF FLUID.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10404 ABORT: 1/1

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: RUPTURE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	3/3	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: MATERIAL DEFECT, MISHANDLING OR ABUSE

EFFECTS/RATIONALE:

LOSS OF HYDRAULIC SYSTEM 1. GEAR MAY BE SLOW TO DEPLOY IF THE
ACTUATOR JAMS UP OR IT MAY NOT DEPLOY AT ALL.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10405 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: FILTER BLOCKED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	3/3		TAL:	3/3
ONORBIT:	3/3		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE HYDRAULIC PRESSURE WILL BE BLOCKED TO THE GEAR, BUT THE GEAR WILL DEPLOY DUE TO GRAVITY AND AIRFLOW AND WITH THE ASSIST OF THE NOSE LANDING GEAR EXTENSION BOOSTER PYRO ACTUATOR.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10406 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: CAVITATION ORIFICE BLOCKED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

IF THE CAVITATION ORIFICE IS BLOCKED THE HYDRAULIC PRESSURE IS BLOCKED TO THE GEAR, BUT THE GEAR WILL DEPLOY DUE TO GRAVITY AND AIRFLOW AND WITH THE ASSIST OF THE NOSE LANDING GEAR EXTENSION BOOSTER PYRO ACTUATOR.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10407 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: CAVITATION CHECK VALVE - OPEN / CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE HYDRAULIC PRESSURE WILL BE BLOCKED TO THE GEAR, BUT THE GEAR WILL DEPLOY DUE TO GRAVITY AND AIRFLOW AND WITH THE ASSIST OF THE NOSE LANDING GEAR EXTENSION BOOSTER PYRO ACTUATOR.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10407 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: CAVITATION CHECK VALVE - OPEN / CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE HYDRAULIC PRESSURE WILL BE BLOCKED TO THE GEAR, BUT THE GEAR WILL DEPLOY DUE TO GRAVITY AND AIRFLOW AND WITH THE ASSIST OF THE NOSE LANDING GEAR EXTENSION BOOSTER PYRO ACTUATOR.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10408 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: SHUTTLE VALVE READY (OPEN)

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THE NORMAL POSITION FOR INFLIGHT OPERATIONS IS OPEN.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10408 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: SHUTTLE VALVE READY (OPEN)

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THE NORMAL POSITION FOR INFLIGHT OPERATIONS IS OPEN.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10409 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: HIGH PRESSURE RELIEF VALVE - OPEN

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	3/3		TAL:	3/3
ONORBIT:	3/3		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: BROKEN SPRING

EFFECTS/RATIONALE:

THE RELIEF VALVE HELPS REGULATE THE FLUID FLOW DURING LANDING
GEAR EXTENSION. THE LANDING GEAR WILL STILL DEPLOY.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10410 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: HIGH PRESSURE RELIEF VALVE - CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC	
PRELAUNCH:	3/3	RTLS:	3/3	
LIFTOFF:	3/3	TAL:	3/3	
ONORBIT:	3/3	AOA:	3/3	
DEORBIT:	3/3	ATO:	3/3	
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE RELIEF VALVE HELPS REGULATE THE FLUID FLOW DURING LANDING
GEAR EXTENSION. THE LANDING GEAR WILL STILL DEPLOY.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10411 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: LOW PRESSURE RELIEF VALVE - OPEN

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
INTERNAL BYPASS OF FLUID RELIEVES PRESSURE WHEN THE GEAR IS
RETRACTED.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10412 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: CHECK VALVE - OPEN / CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE CHECK VALVE HELPS REGULATE THE HYDRAULIC FLUID. IT IS NOT
NEEDED FOR DEPLOYMENT.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10413 ABORT: 1/1

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: SHUTTLE VALVE (CLOSED)

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	3/3	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: BROKEN SPRING, CONTAMINATION

EFFECTS/RATIONALE:

THE LANDING GEAR CANNOT EXTEND IF THE VALVE IS CLOSED. HYDRAULIC
FLUID CANNOT GET OUT OF THE BACK SIDE OF THE PISTON

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10414 ABORT: 1/1

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: TIMING ORIFICE BLOCKED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	3/3	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE TIMING ORIFICE IS USED TO HELP REGULATE THE FLOW OF HYDRAULIC FLUID DURING LANDING GEAR DEPLOYMENT. IF THE ORIFICE IS BLOCKED THE GEAR WILL NOT EXTEND OR THE TIME OF EXTENSION WILL BE INCREASED.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10415 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: LOW PRESSURE RELIEF - OPEN / CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE GEAR WILL STILL DEPLOY. THE RELIEF VALVE WILL LIMIT THE
FLUID LOSS IF THE LEAK IS ON THE GROSS SIDE

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10415 ABORT: 3/3

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: LOW PRESSURE RELIEF - OPEN / CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE GEAR WILL STILL DEPLOY. THE RELIEF VALVE WILL LIMIT THE
FLUID LOSS IF THE LEAK IS ON THE GROSS SIDE

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 10416 ABORT: 2/1R

ITEM: NLG EXTEND / RETRACT HYD STRUT ACTUATOR
FAILURE MODE: TEMPERATURE TRANSDUCER BOSS LEAK

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	2/1R
LIFTOFF:	3/3		TAL:	2/1R
ONORBIT:	3/3		AOA:	2/1R
DEORBIT:	3/3		ATO:	2/1R
LANDING/SAFING:	2/1R			

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: SEAL DAMAGE

EFFECTS/RATIONALE:

POSSIBLE LOSS OF HYDRAULIC SYSTEM 1 AND THE GEAR WILL NOT EXTEND HYDRAULICALLY. THE GEAR WILL EXTEND BY GRAVITY AND AIRFLOW AND WITH THE ASSIST OF THE NOSE LANDING GEAR EXTENSION BOOSTER PYRO ACTUATOR.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10501 ABORT: 1/1

ITEM: NLG DOOR EXTEND / RETRACT MECHANISM
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) DOOR EXTEND / RETRACT MECHANISM
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 1/1
LIFTOFF:	3/3	TAL: 1/1
ONORBIT:	3/3	AOA: 1/1
DEORBIT:	1/1	ATO: 3/3
LANDING/SAFING:	1/1	

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: V070-510601

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, MECHANICAL SHOCK, MISHANDLING OR ABUSE, DEBRIS LODGED IN LINKAGE.

EFFECTS/RATIONALE:

DOORS WON'T POSSIBLY OPEN. GEAR WILL TRY TO DEPLOY THROUGH THE DOORS. DOOR HOOK(S) DOWNSTREAM OF THE FAILURE WON'T RELEASE. GEAR WILL NOT DEPLOY IN TIME FOR LANDING.

REFERENCES: V070-510601, V070-510501, 13.1 SSSH, JSC 12770 - VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10501 ABORT: 1/1

ITEM: NLG DOOR EXTEND / RETRACT MECHANISM
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) DOOR EXTEND / RETRACT MECHANISM
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: V070-510601

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, MECHANICAL
SHOCK, MISHANDLING OR ABUSE, DEBRIS LODGED IN LINKAGE.

EFFECTS/RATIONALE:

DOORS WON'T POSSIBLY OPEN. GEAR WILL TRY TO DEPLOY THROUGH THE
DOORS. DOOR HOOK(S) DOWNSTREAM OF THE FAILURE WON'T RELEASE.
GEAR WILL NOT DEPLOY IN TIME FOR LANDING.

REFERENCES: V070-510601, V070-510501, 13.1 SSSH, JSC 12770 -
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INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 10601 ABORT: 3/3

ITEM: NLG DOOR OVER-CENTER BUNGEE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) DOOR OVER-CENTER BUNGEE
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: V070-510630-001

CAUSES: PIECE-PART STRUCTURAL FAILURE, MISHANDLING OR ABUSE,
DEBRIS LODGED IN LINKAGE.

EFFECTS/RATIONALE:

DOORS MAY NOT STAY FULLY OPEN AFTER NOSE LANDING GEAR IS DEPLOYED

REFERENCES: V070-510601, 13.1 SSSH, JSC 12770 - VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10701 ABORT: 1/1

ITEM: NLG UPLOCK HOOK ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) GEAR UPLOCK HOOK ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: V070-510550

CAUSES: PIECE-PART STRUCTURAL FAILURE, MISHANDLING OR ABUSE,
DEBRIS LODGED IN LINKAGE.

EFFECTS/RATIONALE:
LANDING GEAR WILL NOT DEPLOY

REFERENCES: V070-510550, V070-510601, 13.1 SSSH, JSC 12770 -
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INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10901 ABORT: 1/1

ITEM: NLG DOOR HOOK ACT LINKAGE
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) DOOR HOOK ACTUATION LIKKAGE
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: V070-510701-001, V070-510711-001

CAUSES: PIECE-PART STRUCTURAL FAILURE, MISHANDLING OR ABUSE,
DEBRIS LODGED IN LINKAGE.

EFFECTS/RATIONALE:
THE LANDING GEAR WILL NOT EXTEND IN TIME FOR LANDING

REFERENCES: V070-510601, 13.1 SSSH, JSC 12770 - VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 10901 ABORT: 1/1

ITEM: NLG DOOR HOOK ACT LINKAGE
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) DOOR HOOK ACTUATION LIKKAGE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: V070-510701-001, V070-510711-001

CAUSES: PIECE-PART STRUCTURAL FAILURE, MISHANDLING OR ABUSE,
DEBRIS LODGED IN LINKAGE.

EFFECTS/RATIONALE:
THE LANDING GEAR WILL NOT EXTEND IN TIME FOR LANDING

REFERENCES: V070-510601, 13.1 SSSH, JSC 12770 - VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 11003 ABORT: 2/1R

ITEM: NLG UPLOCK ACTUATOR
FAILURE MODE: LEAK EXTERNAL

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR UPLOCK MECHANISM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/3	AOA:	2/1R
DEORBIT:	3/3	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0002

CAUSES: O-RING SEAL DAMAGE, VIBRATION, LOOSE BOLTS

EFFECTS/RATIONALE:

POSSIBLE LOSS OF HYDRAULIC SYSTEM 1 AND THE GEAR WILL NOT RELEASE HYDRAULICALLY. THE PYRO BACKUP WILL RELEASE THE GEAR ONE SECOND AFTER THE COMMAND TO DEPLOY IF THE LANDING GEAR HOOK IS NOT OPEN

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 11004 ABORT: 2/1R

ITEM: NLG UPLOCK ACTUATOR
FAILURE MODE: BROKEN ROD / LINKAGE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR UPLOCK MECHANISM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/3	AOA:	2/1R
DEORBIT:	3/3	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0002

CAUSES: STRESS / FRACTURE

EFFECTS/RATIONALE:

THE GEAR WILL NOT RELEASE HYDRAULICALLY. THE PYRO BACKUP WILL RELEASE THE GEAR ONE SECOND AFTER THE COMMAND TO DEPLOY IF THE LANDING GEAR HOOK IS NOT OPEN

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 11005 ABORT: 2/1R

ITEM: NLG UPLOCK ACTUATOR
FAILURE MODE: RUPTURE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR UPLOCK MECHANISM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 2/1R
LIFTOFF:	3/3	TAL: 2/1R
ONORBIT:	3/3	AOA: 2/1R
DEORBIT:	3/3	ATO: 2/1R
LANDING/SAFING:	2/1R	

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0002

CAUSES: MATERIAL DEFECT

EFFECTS/RATIONALE:

HYDRAULIC SYSTEM 1 WILL BE LOST AND THE GEAR WILL NOT RELEASE HYDRAULICALLY. THE PYRO BACKUP WILL RELEASE THE GEAR ONE SECOND AFTER THE COMMAND TO DEPLOY IF THE LANDING GEAR HOOK IS NOT OPEN.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 11006 ABORT: 3/3

ITEM: NLG UPLOCK ACTUATOR
FAILURE MODE: LEAK - INTERNAL PISTON

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR COMPARTMENT
- 2) NOSE LANDING GEAR
- 3) NOSE LANDING GEAR UPLOCK MECHANISM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC	
PRELAUNCH:	3/3	RTLS:	3/3	
LIFTOFF:	3/3	TAL:	3/3	
ONORBIT:	3/3	AOA:	3/3	
DEORBIT:	3/3	ATO:	3/3	
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC287-0033-0002

CAUSES: SEAL DAMAGE

EFFECTS/RATIONALE:
THE HYDRAULIC PUMP WILL COMPENSATE FOR THE LOSS OF FLUID.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 11101 ABORT: 1/1

ITEM: NLG B/U PYRO UPLOCK RELEASE MECH
FAILURE MODE: INADVERTANT FIRING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) NOSE LANDING GEAR BACKUP PYRO UPLOCK RELEASE MECHANISM
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	1/1	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC325-0006-0002 (GFE)

CAUSES: THERMAL, ERRONEOUS SIGNAL

EFFECTS/RATIONALE:

NOSE LANDING GEAR WILL EXTEND CAUSING LOSS OF VEHICLE. DURING ORBIT, RESCUE MUST BE MADE AVAILABLE.

REFERENCES: VO70-510601, VO70-510501, 13.1 SSSH, JSC 12770 - VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 11102 ABORT: 1/1

ITEM: NLG B/U PYRO UPLOCK RELEASE MECH
FAILURE MODE: FAIL TO FIRE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) NOSE LANDING GEAR BACKUP PYRO UPLOCK RELEASE MECHANISM
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC325-0006-0002 (GFE)

CAUSES: ELECTRICAL FAILURE, CARTRIDGE FAILURE

EFFECTS/RATIONALE:

NOSE LANDING GEAR WILL NOT DEPLOY IF HYDRAULIC SYSTEM 1 IS NOT FUNCTIONING.

REFERENCES: VO70-510601, VO70-510501, 13.1 SSSH, JSC 12770 -
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INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 11201 ABORT: 1/1

ITEM: NLG EXTENSION BOOSTER PYRO ACT
FAILURE MODE: INADVERTANT FIRING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) NOSE LANDING GEAR EXTENSION BOOSTER PYRO ACTUATOR
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	1/1	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC325-0006-0002 (GFE)

CAUSES: THERMAL, ERRONEOUS SIGNAL

EFFECTS/RATIONALE:

PREMATURE OR INADVERTANT FIRING MAY CAUSE THE NLG TO DEPLOY AT AN INOPPORTUNE TIME. IF THE ACTUATOR FIRES ON ORBIT THE NLG CANNOT BE RETRACTED AND ENTRY WITH THE GEAR DEPLOYED WOULD CAUSE A LOSS OF THE CREW AND VEHICLE. AN EARLY DEPLOY DURING DEORBIT COULD CAUSE A LOSS OF VEHICLE CONTROL AND EXCESSIVE VEHICLE DAMAGE DUE TO DYNAMIC PRESSURES DURING SUPERSONIC FLIGHT WITH THE NLG DEPLOYED. FAILURES OF THIS NATURE WOULD CAUSE THE LOSS OF THE CREW AND THE VEHICLE.

REFERENCES: VO70-510601, VO70-510501, 13.1 SSSH, JSC 12770 -
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ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 11202 ABORT: 1/1

ITEM: NLG EXTENSION BOOSTER PYRO ACT
FAILURE MODE: FAIL TO FIRE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) NOSE LANDING GEAR EXTENSION BOOSTER PYRO ACTUATOR
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	1/1
LIFTOFF:	3/3		TAL:	1/1
ONORBIT:	3/3		AOA:	1/1
DEORBIT:	1/1		ATO:	3/3
LANDING/SAFING:	1/1			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: MC325-0006-0002 (GFE)

CAUSES: ELECTRICAL FAILURE, CARTRIDGE FAILURE

EFFECTS/RATIONALE:

LOSS OF CREW AND VEHICLE IF THE NOSE LANDING GEAR DOESN'T EXTEND
IN TIME

REFERENCES: VO70-510601, VO70-510501, 13.1 SSSH, JSC 12770 -
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ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 11301 ABORT: 1/1

ITEM: NLG DOOR BUNGEE ASSIST ASSY
FAILURE MODE: STRUCTURAL FAILURE, FAILS TO RELEASE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) NOSE LANDING GEAR DOOR BUNGEE ASSIST ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: V070-510751

CAUSES: PIECE-PART STRUCTURAL FAILURE, MISHANDLING OR ABUSE,
PHYSICAL BINDING / JAMMING

EFFECTS/RATIONALE:
NOSE LANDING WILL FAIL TO EXTEND IN TIME FOR LANDING.

REFERENCES: V070-510601, V070-510751, 13.1 SSSH, JSC 12770 -
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ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 11302 ABORT: 1/1

ITEM: NLG DOOR BUNGEE ASSIST ASSY
FAILURE MODE: STRUCTURAL FAILURE, INADVERTANT RELEASE

LEAD ANALYST: W.WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) NOSE LANDING GEAR
- 2) NOSE LANDING GEAR COMPARTMENT
- 3) NOSE LANDING GEAR DEPLOY MECHANISM
- 4) NOSE LANDING GEAR DOOR BUNGEE ASSIST ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	1/1	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: NOSE LANDING GEAR
PART NUMBER: V070-510751

CAUSES: PIECE-PART STRUCTURAL FAILURE, MISHANDLING OR ABUSE,
VIBRATIONS.

EFFECTS/RATIONALE:

POSSIBLE PARTIAL DOOR DEPLOY OR FULL DEPLOY OF THE NOSE LANDING
GEAR. POSSIBLE DOOR AND DOOR UPLOCK MECHANISM DAMAGE IN THE AREA
OF IMPACT FROM THE BUNGEE.

REFERENCES: V070-510601, V070-510751, 13.1 SSSH, JSC 12770 -
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ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20101 ABORT: 1/1

ITEM: TIRES, MLG TYPE I
FAILURE MODE: RUPTURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR - TIRES
- 2) TIRES
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	3/3	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: 006-866-1 B. F. GOODRICH, MC194-0007-0003

CAUSES: OVERLOAD, CUTS, CONSTRUCTION FLAWS

EFFECTS/RATIONALE:

A RUPTURE OF A MAIN LANDING GEAR TIRE AT TOUCHDOWN WOULD CAUSE OVERLOADING ON THE SECOND TIRE ON THAT LANDING GEAR WHICH COULD RESULT IN A LOSS OF THE CREW AND THE VEHICLE DUE TO LOSS OF CONTROL. ADDITIONAL PROBLEMS COULD INCLUDE SHEARING AN AXLE, DAMAGING A TORQUE ARM, RUPTURING THE BRAKE LINES ON THE TORQUE ARM, AND CAUSING BRAKING / STEERING PROBLEMS FOR THE LANDING.

REFERENCES: MC194-0007 - THE ONLY DOCUMENT AVAILABLE FOR THE EVALUATION IS THE PROCUREMENT SPECIFICATION.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20201 ABORT: 1/1

ITEM: SHOCK STRUT STRUCTURE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) SHOCK STRUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: 1170100 MENASCO, MC621-0011

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE -
CORROSION - CRACKING, MECHANICAL SHOCK, OVERLOAD.

EFFECTS/RATIONALE:

A STRUCTURAL FAILURE OF THE SHOCK STRUT IN EITHER OF THE UPPER ARMS, THE LOWER PISTON ASSEMBLY, OR THE AXLE RETAINING ASSEMBLY AT THE MAIN LANDING GEAR TOUCHDOWN WOULD CAUSE A CONDITION WHERE A LOSS OF THE CREW AND THE VEHICLE WOULD BE PROBABLE.

REFERENCES: MC621-0011, 1170100, 1170101, 1170114, 1170182

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20202 ABORT: 1/1

ITEM: SHOCK STRUT PISTON ASSEMBLY
FAILURE MODE: INTERNAL / EXTERNAL LEAKAGE (HYDRAULIC FLUID)

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) SHOCK STRUT
- 4) SHOCK STRUT PISTON ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: 1170100 MENASCO, MC621-0011

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
SEAL FAILURE.

EFFECTS/RATIONALE:

WITHOUT HYDRAULIC FLUID TO ACT AS THE DAMPING MEDIUM, THE
COLLAPSE OF THE SHOCK STRUT DURING LANDING WOULD CAUSE MECHANICAL
SHOCK TO THE UPPER STRUCTURE AND THE TRUNIONS THAT WOULD EXCEED
THE CAPABILITY OF THE PARTS. THE LANDING GEAR WOULD COLLAPSE AT
TOUCHDOWN CAUSING A PROBABLE LOSS OF THE CREW AND THE VEHICLE.

REFERENCES: MC621-0011, 1170100, 1170101, 1170114, 1170182

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 20203 ABORT: 3/1R

ITEM: SHOCK STRUT PISTON ASSEMBLY
FAILURE MODE: INTERNAL / EXTERNAL LEAKAGE (NITROGEN)

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) SHOCK STRUT
- 4) SHOCK STRUT PISTON ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/3	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/3
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: 1170100 MENASCO, MC621-0011

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
SEAL FAILURE.

EFFECTS/RATIONALE:

WITHOUT NITROGEN THERE WOULD BE A PARTIAL LOSS OF EFFECTIVENESS.
THE LOSS OF NITROGEN PRESSURE IN THE SHOCK STRUT ASSEMBLY WILL
NOT PREVENT THE FUNCTIONING OF THE HYDRAULIC PORTION OF THE SHOCK
STRUT

REFERENCES: MC621-0011, 1170100, 1170101, 1170114, 1170182

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20204 ABORT: 1/1

ITEM: TORQUE ARM ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) TORQUE ARM ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0012, 1170353-1 MENASCO

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK.

EFFECTS/RATIONALE:

A STRUCTURAL FAILURE AT MLG TOUCHDOWN COULD CAUSE THE WHEELS TO ROTATE CAUSING THE AFFECTED MLG TO COLLAPSE. THE TORQUE ARM PREVENTS ROTATION OF THE PISTON AND AXLE ASSEMBLY. IF THE AXLE WERE TO ROTATE THE MAIN GEAR WOULD COLLAPSE CAUSING A PROBABLE LOSS OF THE CREW AND THE VEHICLE

REFERENCES: MC621-0011, VO70-510001, 1170300

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20205 ABORT: 1/1

ITEM: AXLE KIT - MLG
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) AXLE KIT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0011, 1170182-103 MENASCO, 1170190-101
MENASCO

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK, OVERLOAD.

EFFECTS/RATIONALE:

AN AXLE FAILURE AT TOUCHDOWN WOULD CAUSE A COLLAPSE OF THE
AFFECTED MAIN LANDING GEAR. THERE WOULD BE A PROBABLE LOSS OF THE
CREW AND THE VEHICLE AS A RESULT.

REFERENCES: MC621-0011, 1170182

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20206 ABORT: 1/1

ITEM: LOWER DRAG BRACE STRUT
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) LOWER DRAG BRACE STRUT
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0011-0009, 1170300-503 MENASCO, 1170301
MENASCO

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
OVERLOAD, MECHANICAL SHOCK.

EFFECTS/RATIONALE:

A LOWER DRAG BRACE STRUT FAILURE WOULD CAUSE AN IMMEDIATE
COLLAPSE OF THE MAIN LANDING GEAR. THIS FAILURE COULD CAUSE THE
LOSS OF THE VEHICLE AND THE CREW.

REFERENCES: MC621-0011, VO70-510201, 1170300, 1170301

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20207 ABORT: 1/1

ITEM: UPPER DRAG BRACE TRUNIONS (2 EA)
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) UPPER DRAG BRACE TRUNIONS
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0011-0009, 1170306-1 MENASCO

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE -
CORROSION - CRACKING, OVERLOAD, MECHANICAL SHOCK.

EFFECTS/RATIONALE:

THE LOSS OF EITHER OF THE UPPER DRAG BRACE TRUNIONS ON EITHER MAIN LANDING GEAR WOULD CAUSE FAILURES THAT WOULD CAUSE THE COLLAPSE OF THE MAIN LANDING GEAR. A LOSS OF THE VEHICLE AND THE CREW WOULD BE PROBABLE WITH THIS FAILURE

REFERENCES: MC621-0011, VO70-510201, 1170300, 1170301

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20208 ABORT: 1/1

ITEM: LOCK BRACE ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) LOCK BRACE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0011-0011, 1170350-507 MENASCO

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE -
CORROSION - CRACKING, OVERLOAD, MECHANICAL SHOCK.

EFFECTS/RATIONALE:

A STRUCTURAL FAILURE OF THE LOCK BRACE ASSEMBLY ON EITHER MAIN
LANDING GEAR WOULD ALLOW THAT GEAR TO COLLAPSE DURING LANDING.
PROBABLE LOSS OF THE VEHICLE AND THE CREW.

REFERENCES: MC621-0011, V070-510201, 1170350, 1170300, 1170301

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20209 ABORT: 1/1

ITEM: DOWN LOCK BUNGEE
FAILURE MODE: PHYSICAL BINDING / JAMMING (BENT BUNGEE)

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) LOCK BRACE ASSEMBLY
- 4) DOWN LOCK BUNGEE
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	1/1
LIFTOFF:	3/3		TAL:	3/1R
ONORBIT:	3/3		AOA:	3/1R
DEORBIT:	1/1		ATO:	3/3
LANDING/SAFING:	1/1			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0011, 1170315-103 MENASCO

CAUSES: MISHANDLING OR ABUSE.

EFFECTS/RATIONALE:

THERE WOULD BE A POSSIBLE LOSS OF CREW AND VEHICLE AFTER THE HYDRAULICS SYSTEM 1 IS SHUT DOWN. THE LANDING GEAR COULD COLLAPSE IF THE BUNGEE WERE NOT AVAILABLE TO LOCK THE LOCK BRACE INTO THE SAFE POSITION. HYDRAULICS SYSTEM 1 WILL LOWER AND SECURE

THE GEAR THROUGH ROLLOUT BUT WHEN THE APU'S ARE SHUT DOWN THE REDUNDANCY IS LOST AND THE GEAR COULD COLLAPSE DUE TO MINOR VEHICLE MOVEMENTS.

REFERENCES: MC621-0011, VO70-510201, 1170350, 1170300, 1170301

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20210 ABORT: 1/1

ITEM: DOWN LOCK BUNGEE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) LOCK BRACE ASSEMBLY
- 4) DOWN LOCK BUNGEE
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/1R
LIFTOFF:	3/3	TAL: 3/1R
ONORBIT:	3/3	AOA: 3/1R
DEORBIT:	3/1R	ATO: 3/3
LANDING/SAFING:	1/1	

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0011, 1170315-103 MENASCO

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE -
CORROSION - CRACKING, OVERLOAD, MECHANICAL SHOCK.

EFFECTS/RATIONALE:

THERE WOULD BE A POSSIBLE LOSS OF CREW AND VEHICLE AFTER THE
HYDRAULICS SYSTEM 1 IS SHUT DOWN. THE LANDING GEAR COULD
COLLAPSE IF THE BUNGEE WERE NOT AVAILABLE TO LOCK THE LOCK BRACE
INTO THE SAFE POSITION. HYDRAULICS SYSTEM 1 WILL LOWER AND
SECURE
THE GEAR THROUGH ROLLOUT BUT WHEN THE APU'S ARE SHUT DOWN THE
REDUNDANCY IS LOST AND THE GEAR COULD COLLAPSE DUE TO MINOR
VEHICLE MOVEMENTS.

REFERENCES: MC621-0011, VO70-510201, 1170350, 1170300, 1170301

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20211 ABORT: 3/3

ITEM: MLG DOWN AND LOCK SENSORS
FAILURE MODE: SHORTED OPEN

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) MAIN LANDING GEAR DOWN AND LOCK SENSORS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: VO70-510340

CAUSES: MISHANDLING OR ABUSE, PIECE-PART FAILURE - CORROSION,
VIBRATION.

EFFECTS/RATIONALE:

THE CREW WOULD NOT BE ABLE TO VERIFY THAT THE MAIN LANDING GEAR
WAS DOWN AND LOCKED IN POSITION.

REFERENCES: MC621-0011, VO70-510201, 1170350

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20212 ABORT: 3/3

ITEM: MLG DOWN AND LOCK SENSORS
FAILURE MODE: SHORTED CLOSED

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) MAIN LANDING GEAR DOWN AND LOCK SENSORS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: VO70-510340

CAUSES: MISHANDLING OR ABUSE, PIECE-PART FAILURE - CORROSION,
VIBRATION.

EFFECTS/RATIONALE:

THE CREW WOULD NOT BE ABLE TO VERIFY THAT THE MAIN LANDING GEAR
WAS DOWN AND LOCKED IN POSITION.

REFERENCES: MC621-0011, VO70-510201, 1170350

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20213 ABORT: 3/3

ITEM: MLG DOWN AND LOCK SENSORS
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) MAIN LANDING GEAR DOWN AND LOCK SENSORS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: VO70-510340

CAUSES: MISHANDLING OR ABUSE, PIECE-PART FAILURE.

EFFECTS/RATIONALE:

CONTACT WOULD NOT BE MADE IF THE STRUCTURAL FAILURE OCCURRED,
THEREFORE NO INPUT WOULD BE OBSERVED BY THE CREW.

REFERENCES: MC621-0011, VO70-510201, 1170350

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20214 ABORT: 3/3

ITEM: WEIGHT ON WHEELS SENSOR - MLG
FAILURE MODE: SHORTED OPEN

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) WEIGHT ON WHEELS SENSOR - MLG
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: VO70-510340

CAUSES: MISHANDLING OR ABUSE, PIECE-PART FAILURE - CORROSION,
VIBRATION.

EFFECTS/RATIONALE:

A FAILURE TO FUNCTION PROPERLY COULD RESULT IN A LOSS OF ANTI-SKID PROTECTION DURING ROLLOUT. THE BRAKES WILL FUNCTION WITHOUT THE ANTI-SKID FUNCTION.

REFERENCES: MC621-0011, VO70-510201

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20215 ABORT: 3/3

ITEM: WEIGHT ON WHEELS SENSOR - MLG
FAILURE MODE: SHORTED CLOSED

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) WEIGHT ON WHEELS SENSOR - MLG
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: VO70-510340

CAUSES: MISHANDLING OR ABUSE, PIECE-PART FAILURE - CORROSION,
VIBRATION.

EFFECTS/RATIONALE:

A FAILURE TO FUNCTION PROPERLY COULD RESULT IN A LOSS OF ANTI-
SKID PROTECTION DURING ROLLOUT. THE BRAKES WILL FUNCTION WITHOUT
THE ANTI-SKID FUNCTION.

REFERENCES: MC621-0011, VO70-510201

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20216 ABORT: 1/1

ITEM: UPLOCK ROLLER RETAINING ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) UPLOCK ROLLER RETAINING ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	1/1	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: 1170149 MENASCO, MC621-0011

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
MECHANICAL SHOCK, OVERLOAD, VIBRATION.

EFFECTS/RATIONALE:

IF THE UPLOCK ROLLER RETAINING ASSEMBLY WILL NOT SECURE THE MAIN LANDING GEAR IN POSITION, THE MAIN LANDING GEAR WILL BE LOOSE IN THE MAIN LANDING GEAR COMPARTMENT. THE WEIGHT OF THE MLG AGAINST THE DOOR COULD CAUSE AN INADVERTANT LANDING GEAR DEPLOY DURING LAUNCH OPERATIONS OF DURING DEORBIT. THIS WOULD CAUSE MAJOR DAMAGE TO THE VEHICLE AND AFFECT VEHICLE PERFORMANCE. THERE WOULD BE A PROBABLE LOSS OF THE CREW AND THE VEHICLE.

REFERENCES: MC621-0011, VO70-510201, VO70-510202, 1170100,
1170101

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20217 ABORT: 1/1

ITEM: TORQUE TUBE ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) TORQUE TUBE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: 1170353-101 MENASCO, MC621-0011

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE.

EFFECTS/RATIONALE:

A STRUCTURAL FAILURE OF THE MLG TORQUE TUBE ASSEMBLY COULD CAUSE THE GEAR TO NOT DEPLOY IN TIME FOR LANDING, THE MLG LOCK BRACE ASSEMBLY WOULD NOT FUNCTION PROPERLY, AND IT WOULD POSSIBLY NOT SECURE THE EXTENDED MLG. THIS COULD CAUSE A COLLAPSE OF THE MAIN LANDING GEAR WHICH WOULD CAUSE THE PROBABLE LOSS OF THE VEHICLE AND THE CREW.

REFERENCES: MC621-0011, VO70-510201, VO70-510202, 1170100, 1170101

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20218 ABORT: 1/1

ITEM: SHOCK STRUT ATTACHING TRUNIONS
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) SHOCK STRUT ATTACHING TRUNIONS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0011, VO70-510476

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE -
CORROSION - CRACKING, MECHANICAL SHOCK, OVERLOAD.

EFFECTS/RATIONALE:

THE STRUCTURAL FAILURE OF ONE OR BOTH OF THE SHOCK STRUT TRUNIONS
WOULD CAUSE A COLLAPSE OF THE MAIN LANDING GEAR. A FAILURE AT
TOUCHDOWN WOULD CAUSE A LOSS OF THE VEHICLE AND PROBABLY THE
CREW.

REFERENCES: MC621-0011, VO70-510201, VO70-510300, VO70-510476,
1170100

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20219 ABORT: 1/1

ITEM: UPPER DRAG BRACE STRUTS (2 EA)
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) UPPER DRAG BRACE STRUTS
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0011-0009, 1170300-501 MENASCO, 1170300-503
MENASCO

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE,
OVERLOAD, MECHANICAL SHOCK.

EFFECTS/RATIONALE: A FAILURE OF ONE OF THE ARMS OF THE UPPER YOKE ASSEMBLY OF THE
DRAG BRACE WOULD CAUSE FAILURES WHICH WOULD RESULT IN THE
COLLAPSE OF THE MAIN LANDINGGEAR. A LOSS OF THE VEHICLE AND THE
CREW WOULD BE PROBABLE WITH THIS FAILURE.

REFERENCES: MC621-0011, VO70-510201, VO70-510300, 1170300,
1170301

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20220 ABORT: 1/1

ITEM: CENTER DRAG BRACE TRUNION (AT LOCK BRACE)
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) CENTER DRAG BRACE TRUNION (AT LOCK BRACE)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 1/1
LIFTOFF:	3/3	TAL: 1/1
ONORBIT:	3/3	AOA: 1/1
DEORBIT:	1/1	ATO: 3/3
LANDING/SAFING:	1/1	

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0011-0011, 1170301-1 MENASCO (2EA) OR,
1170301-3 MENASCO (2EA)

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE -
CORROSION - CRACKING, OVERLOAD, MECHANICAL SHOCK.

EFFECTS/RATIONALE:

THE LOSS OF THE CENTER DRAG BRACE TRUNION WOULD CAUSE AN
IMMEDIATE COLLAPSE OF THE MAIN LANDING GEAR. LOSS OF THE CREW
AND THE VEHICLE WOULD BE PROBABLE.

REFERENCES: MC621-0011, V070-510201, 1170300, 1170301, 1170350

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20221 ABORT: 1/1

ITEM: LOWER DRAG BRACE TRUNION (ATTACHES TO SHOCK STRUT)
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) LOWER DRAG BRACE TRUNION (ATTACHES TO SHOCK STRUT)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0011-0011

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE -
CORROSION - CRACKING, OVERLOAD, MECHANICAL SHOCK.

EFFECTS/RATIONALE:

THE LOSS OF THE LOWER DRAG BRACE TRUNION WOULD CAUSE AN
IMMEDIATE COLLAPSE OF THE MAIN LANDING GEAR. LOSS OF THE CREW
AND THE VEHICLE WOULD BE PROBABLE.

REFERENCES: MC621-0011, VO70-510201, 1170100, 1170301, 1170493

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20222 ABORT: 1/1

ITEM: LOCK BRACE CENTER TRUNION
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) LOCK BRACE ASSEMBLY
- 4) LOCK BRACE CENTER TRUNION
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC621-0011-0011, 1170360-1 MENASCO (2EA), AND
1170361-1 MENASCO

CAUSES: MISHANDLING OR ABUSE, PIECE-PART STRUCTURAL FAILURE -
CORROSION - CRACKING, OVERLOAD, MECHANICAL SHOCK.

EFFECTS/RATIONALE:

A FAILURE OF THE LOCK BRACE CENTRAL TRUNION WOULD CAUSE THE
AFFECTED MLG TO NOT LOCK DOWN WHEN IT IS DEPLOYED. THE GEAR
WOULD COLLAPSE AT LANDING AND A LOSS OF THE VEHICLE AND THE CREW
WOULD BE PROBABLE.

REFERENCES: MC621-0011, VO70-510201, 1170350

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20223 ABORT: 1/1

ITEM: SUPPORT BEAM
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) SHOCK STRUT ASSEMBLY
- 3) DRAG BRACE ASSEMBLY
- 4) SUPPORT BEAM
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: 1170303 MENASCO, MC621-0011

CAUSES: OVERLOAD, CORROSION / CRACKING, PIECE-PART STRUCTURAL
FAILURE, MECHANICAL SHOCK, MISHANDLING OR ABUSE

EFFECTS/RATIONALE:

A STRUCTURAL FAILURE OF THE SUPPORT BEAM WOULD CAUSE TORSION ON
THE DRAG BRACE ASSEMBLY THAT COULD CAUSE THE UPPER DRAG BRACE
TRUNIONS TO FRACTURE DUE TO TORSION. A FAILURE OF THIS NATURE
WOULD RESULT IN THE LOSS OF THE VEHICLE AND THE CREW.

REFERENCES: MC621-0011

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20401 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: BROKEN ROD / LINKAGE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: STRESS / FRACTURE, MISHANDLING OR ABUSE

EFFECTS/RATIONALE:

THE LANDING GEAR WILL NOT EXTEND OR RETRACT HYDRAULICALLY.
GRAVITY AND AIRFLOW WILL EXTEND THE LANDING GEAR.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 20402 ABORT: 2/1R

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: LEAK, EXTERNAL

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/3	AOA:	2/1R
DEORBIT:	3/3	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: O-RING SEALS, VIBRATION, LOOSE BOLTS

EFFECTS/RATIONALE:

POSSIBLE LOSS OF HYDRAULICS SYSTEM 1 AND THE LANDING GEAR WILL NOT EXTEND OR RETRACT HYDRAULICALLY. THE LANDING GEAR WILL EXTEND BY GRAVITY AND AIRFLOW.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20403 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: LEAK, INTERNAL PISTON

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: SEAL DAMAGE, MISHANDLING OR ABUSE

EFFECTS/RATIONALE:
THE HYDRAULIC PUMP WILL COMPENSATE FOR THE LOSS OF FLUID.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20404 ABORT: 1/1

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: RUPTURE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	3/3	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: MATERIAL DEFECT, MISHANDLING OR ABUSE

EFFECTS/RATIONALE:

LOSS OF HYDRAULIC SYSTEM 1. GEAR MAY BE SLOW TO DEPLOY IF THE ACTUATOR JAMS UP OR IT MAY NOT DEPLOY AT ALL.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20405 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: FILTER BLOCKED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE HYDRAULIC PRESSURE WILL BE BLOCKED TO THE GEAR, BUT THE GEAR
WILL DEPLOY DUE TO GRAVITY AND AIRFLOW.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20406 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: CAVITATION ORIFICE BLOCKED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

IF THE CAVITATION ORIFICE IS BLOCKED THE HYDRAULIC PRESSURE IS
BLOCKED TO THE GEAR, BUT THE GEAR WILL DEPLOY DUE TO GRAVITY AND
AIRFLOW.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20407 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: CAVITATION CHECK VALVE - OPEN / CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	3/3		TAL:	3/3
ONORBIT:	3/3		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE HYDRAULIC PRESSURE WILL BE BLOCKED TO THE GEAR, BUT THE GEAR
WILL DEPLOY DUE TO GRAVITY AND AIRFLOW.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20407 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: CAVITATION CHECK VALVE - OPEN / CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC	
PRELAUNCH:	3/3	RTLS:	3/3	
LIFTOFF:	3/3	TAL:	3/3	
ONORBIT:	3/3	AOA:	3/3	
DEORBIT:	3/3	ATO:	3/3	
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE HYDRAULIC PRESSURE WILL BE BLOCKED TO THE GEAR, BUT THE GEAR WILL DEPLOY DUE TO GRAVITY AND AIRFLOW.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20408 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: CHECK VALVE - OPEN / CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/3
LIFTOFF:	3/3	TAL: 3/3
ONORBIT:	3/3	AOA: 3/3
DEORBIT:	3/3	ATO: 3/3
LANDING/SAFING:	3/3	

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE CHECK VALVE HELPS REGULATE THE HYDRAULIC FLUID. IT IS NOT
NEEDED FOR DEPLOYMENT.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20408 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: CHECK VALVE - OPEN / CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	3/3		TAL:	3/3
ONORBIT:	3/3		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE CHECK VALVE HELPS REGULATE THE HYDRAULIC FLUID. IT IS NOT
NEEDED FOR DEPLOYMENT.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20409 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: HIGH PRESSURE RELIEF VALVE - OPEN

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: BROKEN SPRING

EFFECTS/RATIONALE:

THE RELIEF VALVE HELPS REGULATE THE FLUID FLOW DURING LANDING
GEAR EXTENSION. THE LANDING GEAR WILL STILL DEPLOY.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20410 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: HIGH PRESSURE RELIEF VALVE - CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE RELIEF VALVE HELPS REGULATE THE FLUID FLOW DURING LANDING
GEAR EXTENSION. THE LANDING GEAR WILL STILL DEPLOY.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20411 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: LOW PRESSURE RELIEF VALVE - OPEN

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
INTERNAL BYPASS OF FLUID RELIEVES PRESSURE WHEN THE GEAR IS
RETRACTED.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20412 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: SHUTTLE VALVE READY (OPEN)

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THE NORMAL POSITION FOR INFLIGHT OPERATIONS IS OPEN.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20413 ABORT: 1/1

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: SHUTTLE VALVE (CLOSED)

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	3/3	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: BROKEN SPRING, CONTAMINATION

EFFECTS/RATIONALE:

THE LANDING GEAR CANNOT EXTEND IF THE VALVE IS CLOSED. HYDRAULIC
FLUID CANNOT GET OUT OF THE BACK SIDE OF THE PISTON

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20414 ABORT: 1/1

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: TIMING ORIFICE BLOCKED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	3/3	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE TIMING ORIFICE IS USED TO HELP REGULATE THE FLOW OF HYDRAULIC FLUID DURING LANDING GEAR DEPLOYMENT. IF THE ORIFICE IS BLOCKED THE GEAR WILL NOT EXTEND OR THE TIME OF EXTENSION WILL BE INCREASED.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20415 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: LOW PRESSURE RELIEF - OPEN / CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE GEAR WILL STILL DEPLOY. THE RELIEF VALVE WILL LIMIT THE
FLUID LOSS IF THE LEAK IS ON THE GROSS SIDE

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20415 ABORT: 3/3

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: LOW PRESSURE RELIEF - OPEN / CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THE GEAR WILL STILL DEPLOY. THE RELIEF VALVE WILL LIMIT THE
FLUID LOSS IF THE LEAK IS ON THE GROSS SIDE

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 20416 ABORT: 2/1R

ITEM: MLG EXTEND / RETRACT HYD STRUT ACT
FAILURE MODE: TEMPERATURE TRANSDUCER BOSS LEAK

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR EXTEND / RETRACT HYDRAULIC STRUT ACTUATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/3	AOA:	2/1R
DEORBIT:	3/3	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0007

CAUSES: SEAL DAMAGE

EFFECTS/RATIONALE:

POSSIBLE LOSS OF HYDRAULIC SYSTEM 1 AND THE GEAR WILL NOT EXTEND HYDRAULICALLY. THE GEAR WILL EXTEND BY GRAVITY AND AIRFLOW.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20501 ABORT: 1/1

ITEM: DOOR EXTEND / RETRACT MECH
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING /
BREAKING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR EXTEND / RETRACT MECHANISM
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510426

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

DOORS WON'T POSSIBLY OPEN. GEAR WILL NOT DEPLOY IN TIME FOR
LANDING

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20501 ABORT: 1/1

ITEM: DOOR EXTEND / RETRACT MECH
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING /
BREAKING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR EXTEND / RETRACT MECHANISM
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510426

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
DOORS WON'T POSSIBLY OPEN. GEAR WILL NOT DEPLOY IN TIME FOR
LANDING

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20501 ABORT: 1/1

ITEM: DOOR EXTEND / RETRACT MECH
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING /
BREAKING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR EXTEND / RETRACT MECHANISM
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510426

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

DOORS WON'T POSSIBLY OPEN. GEAR WILL NOT DEPLOY IN TIME FOR
LANDING

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20501 ABORT: 1/1

ITEM: DOOR EXTEND / RETRACT MECH
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING /
BREAKING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR EXTEND / RETRACT MECHANISM
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510426

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

DOORS WON'T POSSIBLY OPEN. GEAR WILL NOT DEPLOY IN TIME FOR
LANDING

REFERENCES: VO70-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20501 ABORT: 1/1

ITEM: DOOR EXTEND / RETRACT MECH
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING /
BREAKING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR EXTEND / RETRACT MECHANISM
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	1/1
LIFTOFF:	3/3		TAL:	1/1
ONORBIT:	3/3		AOA:	1/1
DEORBIT:	1/1		ATO:	3/3
LANDING/SAFING:	1/1			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510426

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
DOORS WON'T POSSIBLY OPEN. GEAR WILL NOT DEPLOY IN TIME FOR
LANDING

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20501 ABORT: 1/1

ITEM: DOOR EXTEND / RETRACT MECH
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING /
BREAKING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR EXTEND / RETRACT MECHANISM
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510426

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

DOORS WON'T POSSIBLY OPEN. GEAR WILL NOT DEPLOY IN TIME FOR
LANDING

REFERENCES: VO70-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 20601 ABORT: 3/3

ITEM: DOOR OVER-CENTER BUNGEE
FAILURE MODE: STRUCTURAL FAILURE - BROKEN ROD

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR OVER-CENTER BUNGEE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510440

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS.

EFFECTS/RATIONALE:

DOOR MAY NOT STAY OPEN ONCE THE LANDING GEAR IS DEPLOYED

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20601 ABORT: 1/1

ITEM: MLG UPLOCK HOOK ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) GEAR UPLOCK HOOK ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510301

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:
GEAR WILL NOT DEPLOY.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20701 ABORT: 1/1

ITEM: MLG UPLOCK HOOK ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) GEAR UPLOCK HOOK ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510301

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:
GEAR WILL NOT DEPLOY.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20701 ABORT: 1/1

ITEM: MLG UPLOCK HOOK ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) GEAR UPLOCK HOOK ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510301

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:
GEAR WILL NOT DEPLOY.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20701 ABORT: 1/1

ITEM: MLG UPLOCK HOOK ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) GEAR UPLOCK HOOK ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510301

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:
GEAR WILL NOT DEPLOY.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20701 ABORT: 1/1

ITEM: MLG UPLOCK HOOK ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) GEAR UPLOCK HOOK ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510301

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:
GEAR WILL NOT DEPLOY.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20701 ABORT: 1/1

ITEM: MLG UPLOCK HOOK ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) GEAR UPLOCK HOOK ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		
	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510301

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:
GEAR WILL NOT DEPLOY.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20901 ABORT: 1/1

ITEM: DOOR HOOK ACTUATION LINKAGE
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR HOOK ACTUATION LINKAGE
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: ME162-0009, V070-510201

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:

GEAR WILL NOT EXTEND IN TIME FOR LANDING. IF ANY HOOK GETS
DISENGAGED, THE DOOR WILL PROBABLY CRACK OPEN DURING ENTRY
RESULTING IN THE LOSS OF TILES AND A POSSIBLE BURN THROUGH.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20901 ABORT: 1/1

ITEM: DOOR HOOK ACTUATION LINKAGE
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR HOOK ACTUATION LINKAGE
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: ME162-0009, V070-510201

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:

GEAR WILL NOT EXTEND IN TIME FOR LANDING. IF ANY HOOK GETS
DISENGAGED, THE DOOR WILL PROBABLY CRACK OPEN DURING ENTRY
RESULTING IN THE LOSS OF TILES AND A POSSIBLE BURN THROUGH.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20901 ABORT: 1/1

ITEM: DOOR HOOK ACTUATION LINKAGE
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR HOOK ACTUATION LINKAGE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: ME162-0009, V070-510201

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:

GEAR WILL NOT EXTEND IN TIME FOR LANDING. IF ANY HOOK GETS
DISENGAGED, THE DOOR WILL PROBABLY CRACK OPEN DURING ENTRY
RESULTING IN THE LOSS OF TILES AND A POSSIBLE BURN THROUGH.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20901 ABORT: 1/1

ITEM: DOOR HOOK ACTUATION LINKAGE
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR HOOK ACTUATION LINKAGE
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: ME162-0009, V070-510201

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:

GEAR WILL NOT EXTEND IN TIME FOR LANDING. IF ANY HOOK GETS
DISENGAGED, THE DOOR WILL PROBABLY CRACK OPEN DURING ENTRY
RESULTING IN THE LOSS OF TILES AND A POSSIBLE BURN THROUGH.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20901 ABORT: 1/1

ITEM: DOOR HOOK ACTUATION LINKAGE
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR HOOK ACTUATION LINKAGE
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: ME162-0009, V070-510201

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:

GEAR WILL NOT EXTEND IN TIME FOR LANDING. IF ANY HOOK GETS
DISENGAGED, THE DOOR WILL PROBABLY CRACK OPEN DURING ENTRY
RESULTING IN THE LOSS OF TILES AND A POSSIBLE BURN THROUGH.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 20901 ABORT: 1/1

ITEM: DOOR HOOK ACTUATION LINKAGE
FAILURE MODE: STRUCTURAL FAILURE, PHYSICAL BINDING / JAMMING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) DOOR HOOK ACTUATION LINKAGE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: ME162-0009, V070-510201

CAUSES: PIECE-PART STRUCTURAL FAILURE, VIBRATION, STRESS, DEBRIS.

EFFECTS/RATIONALE:

GEAR WILL NOT EXTEND IN TIME FOR LANDING. IF ANY HOOK GETS
DISENGAGED, THE DOOR WILL PROBABLY CRACK OPEN DURING ENTRY
RESULTING IN THE LOSS OF TILES AND A POSSIBLE BURN THROUGH.

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 21003 ABORT: 2/1R

ITEM: MLG UPLOCK ACTUATOR
FAILURE MODE: LEAK EXTERNAL

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR UPLOCK MECHANISM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC	
PRELAUNCH:	3/3	RTLS:	2/1R	
LIFTOFF:	3/3	TAL:	2/1R	
ONORBIT:	3/3	AOA:	2/1R	
DEORBIT:	3/3	ATO:	2/1R	
LANDING/SAFING:	2/1R			

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0002

CAUSES: O-RING SEAL DAMAGE, VIBRATION, LOOSE BOLTS

EFFECTS/RATIONALE:

POSSIBLE LOSS OF HYDRAULIC SYSTEM 1 AND THE GEAR WILL NOT RELEASE HYDRAULICALLY. THE PYRO BACKUP WILL RELEASE THE GEAR ONE SECOND AFTER THE COMMAND TO DEPLOY IF THE LANDING GEAR HOOK IS NOT OPEN

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 21004 ABORT: 2/1R

ITEM: MLG UPLOCK ACTUATOR
FAILURE MODE: BROKEN ROD / LINKAGE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR UPLOCK MECHANISM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/3	AOA:	2/1R
DEORBIT:	3/3	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0002

CAUSES: STRESS / FRACTURE

EFFECTS/RATIONALE:

THE GEAR WILL NOT RELEASE HYDRAULICALLY. THE PYRO BACKUP WILL RELEASE THE GEAR ONE SECOND AFTER THE COMMAND TO DEPLOY IF THE LANDING GEAR HOOK IS NOT OPEN

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 21005 ABORT: 2/1R

ITEM: MLG UPLOCK ACTUATOR
FAILURE MODE: RUPTURE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR UPLOCK MECHANISM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/3	AOA:	2/1R
DEORBIT:	3/3	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0002

CAUSES: MATERIAL DEFECT

EFFECTS/RATIONALE:

HYDRAULIC SYSTEM 1 WILL BE LOST AND THE GEAR WILL NOT RELEASE HYDRAULICALLY. THE PYRO BACKUP WILL RELEASE THE GEAR ONE SECOND AFTER THE COMMAND TO DEPLOY IF THE LANDING GEAR HOOK IS NOT OPEN.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 21006 ABORT: 3/3

ITEM: MLG UPLOCK ACTUATOR
FAILURE MODE: LEAK - INTERNAL PISTON

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) MAIN LANDING GEAR UPLOCK MECHANISM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC287-0033-0002

CAUSES: SEAL DAMAGE

EFFECTS/RATIONALE:

THE HYDRAULIC PUMP WILL COMPENSATE FOR THE LOSS OF FLUID.

REFERENCES: VO70-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 21101 ABORT: 1/1

ITEM: MLG PYRO UPLOCK RELEASE
FAILURE MODE: INADVERTANT FIRING

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) MAIN LANDING GEAR PYRO UPLOCK RELEASE
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	1/1	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC325-0019-0001

CAUSES: THERMAL, ERRONEOUS SIGNAL

EFFECTS/RATIONALE:
LANDING GEAR WILL EXTEND CAUSING LOSS OF THE VEHICLE. DURING
ORBIT RESCUE WILL BE REQUIRED.

REFERENCES: VO70-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 21102 ABORT: 1/1

ITEM: MLG PYRO UPLOCK RELEASE
FAILURE MODE: FAIL TO FIRE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR DEPLOY MECHANISM
- 4) MAIN LANDING GEAR PYRO UPLOCK RELEASE
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: MC325-0019-0001

CAUSES: ELECTRICAL FAILURE, CARTRIDGE FAILURE

EFFECTS/RATIONALE:

LANDING GEAR WILL NOT LOWER, CAUSING PROBABLE LOSS OF CREW AND VEHICLE DURING LANDING. THIS IS A BACKUP SYSTEM, IT WILL NOT BE USED UNLESS THE PRIMARY SYSTEM FAILS.

REFERENCES: VO70-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 21301 ABORT: 1/1

ITEM: MLG DOOR BOOSTER BUNGEE
FAILURE MODE: FAILS TO FUNCTION

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR
- 2) MAIN LANDING GEAR COMPARTMENT
- 3) MAIN LANDING GEAR RETAINING ASSEMBLY
- 4) MAIN LANDING GEAR DEPLOY MECHANISM
- 5) MAIN LANDING GEAR DOOR BOOSTER BUNGEE
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR
PART NUMBER: V070-510101

CAUSES: FAILURE OF LINKAGE OR SPRING, DEBRIS LOCKS UP SYSTEM

EFFECTS/RATIONALE:
MAIN GEAR FAILS TO EXTEND IN TIME FOR LANDING

REFERENCES: V070-510201, 13.1 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30101 ABORT: 3/3

ITEM: ANTI-SKID SELECT SWITCH
FAILURE MODE: SWITCH MALFUNCTION

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEMS
- 3) ANTI SKID SELECT SWITCH
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: ME452-0102-7201

CAUSES: BROKEN CONNECTOR, CORROSION

EFFECTS/RATIONALE:

NONE; REDUNDANT SWITCH. EVEN IF REDUNDANCY IS LOST, THE VEHICLE
CAN SAFELY BE LANDED IN THE MANUAL MODE.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 30102 ABORT: 2/1R

ITEM: BRAKE PEDAL TRANSDUCER
FAILURE MODE: NO TRANSDUCER DEFLECTION

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) BRAKE PEDAL ASSEMBLY
- 3) BRAKE PEDAL TRANSDUCER ASSEMBLY
- 4) BRAKE PEDAL TRANSDUCER
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/3	AOA:	2/1R
DEORBIT:	2/1R	ATO:	3/3
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: 40-899-1, MC621-0055

CAUSES: BINDING OR BROKEN LINKAGE

EFFECTS/RATIONALE:

NO SIGNAL OUTPUT FROM TRANSDUCER, THEREFORE NO BRAKING FOR THAT SIDE OF THE VEHICLE. THE OTHER SIDE OF THE VEHICLE HAS A REDUNDANT SYSTEM (THE OTHER PILOT).

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 30103 ABORT: 3/1R

ITEM: BRAKE PEDAL TRANSDUCER
FAILURE MODE: SHORT / OPEN (LVDT)

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) BRAKE PEDAL ASSEMBLY
- 3) BRAKE PEDAL TRANSDUCER ASSEMBLY
- 4) BRAKE PEDAL TRANSDUCER
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	3/3		TAL:	3/1R
ONORBIT:	3/3		AOA:	3/1R
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: 40-899-1, MC621-0055

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

LOSS OF ONE LVDT WILL RESULT IN SLIGHT LOSS IN BRAKING EFFICIENCY FROM THAT BRAKE CONTROL. THE OTHER BRAKE CONTROL COULD COMPENSATE.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 30104 ABORT: 1/1

ITEM: BRAKE PEDAL TRANSDUCER
FAILURE MODE: SHORT / CLOSED (LVDT)

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) BRAKE PEDAL ASSEMBLY
- 3) BRAKE PEDAL TRANSDUCER ASSEMBLY
- 4) BRAKE PEDAL TRANSDUCER
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: 40-899-1, MC621-0055

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

CLOSED LVDT WILL RESULT IN HALF-WHEEL LOCKUP WITH ANTI-SKID OFF
AT TOUCHDOWN CAUSING POSSIBLE LOSS OF THE VEHICLE. ANTI-SKID
WILL PROVIDE TOUCHDOWN PROTECTION IF IT IS ON

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 30105 ABORT: 1/1

ITEM: BRAKE CIRCUIT
FAILURE MODE: OPEN OR SHORT CIRCUIT RESULTING IN AN OPEN VALVE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL BOX
- 4) BRAKE CIRCUIT
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: 42-40314 HYDRO-AIRE, MC621-0055

CAUSES: FAILURE OF A RESISTOR, TRANSDUCER, BROKEN WIRE, ETC..

EFFECTS/RATIONALE:

BRAKE PRESSURE IS APPLIED TO ONE WHEEL AT TOUCHDOWN CAUSING A
LOSS OF THE ANTI-SKID PROTECTION AND BRAKE / WHEEL / TIRE DAMAGE.
POSSIBLE LOSS OF CONTROL DURING ROLLOUT.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 30106 ABORT: 3/1R

ITEM: BRAKE CIRCUIT
FAILURE MODE: OPEN OR SHORT CIRCUIT RESULTING IN A CLOSED VALVE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL BOX
- 4) BRAKE CIRCUIT
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	3/3		TAL:	3/1R
ONORBIT:	3/3		AOA:	3/1R
DEORBIT:	3/1R		ATO:	3/3
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: 42-40314 HYDRO-AIRE, MC621-0055

CAUSES: FAILURE OF A RESISTOR, TRANSDUCER, BROKEN WIRE, ETC..

EFFECTS/RATIONALE:
LOSS OF ONE-HALF OF THE BRAKE PRESSURE TO ONE WHEEL.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30107 ABORT: 3/3

ITEM: SKID CIRCUIT
FAILURE MODE: OPEN OR SHORT CIRCUIT RESULTING IN AN OPEN VALVE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL BOX
- 4) SKID CIRCUIT
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: 42-40314 HYDRO-AIRE, MC621-0055

CAUSES: FAILURE OF A RESISTOR, TRANSDUCER, BROKEN WIRE, ETC.

EFFECTS/RATIONALE:

WITH THE ANTI-SKID ON, THE BAD CIRCUIT WILL BE DESELECTED
RESULTING IN REDUCED BRAKING.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30108 ABORT: 3/3

ITEM: SKID CIRCUIT
FAILURE MODE: OPEN OR SHORT CIRCUIT RESULTING IN A CLOSED VALVE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL BOX
- 4) SKID CIRCUIT
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/3
LIFTOFF:	3/3	TAL: 3/3
ONORBIT:	3/3	AOA: 3/3
DEORBIT:	3/3	ATO: 3/3
LANDING/SAFING:	3/3	

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: 42-40314 HYDRO-AIRE, MC621-0055

CAUSES: FAILURE OF A RESISTOR, TRANSDUCER, BROKEN WIRE, ETC..

EFFECTS/RATIONALE:

WITH THE ANTI-SKID ON, THE BAD CIRCUIT WILL BE DESELECTED
RESULTING IN REDUCED BRAKING.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30109 ABORT: 3/3

ITEM: ANTI-SKID FAIL CIRCUIT
FAILURE MODE: OPEN OR SHORT CIRCUIT

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL BOX
- 4) ANTI-SKID FAIL CIRCUIT
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: 42-40314 HYDRO-AIRE, MC621-0055

CAUSES: FAILURE OF A RESISTOR, TRANSDUCER, BROKEN WIRE, ETC..

EFFECTS/RATIONALE:

CIRCUIT TO DETECT FAILURE MAY SHOW FAILURE WHEN THERE ISN'T ONE OR WON'T SHOW ONE WHEN THERE IS ONE. EITHER WAY, THIS BY ITSELF IS NOT A PROBLEM. COULD DESELECT A GOOD CIRCUIT OR VALVE RESULTING IN REDUCED BRAKING CAPABILITY.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30109 ABORT: 3/3

ITEM: ANTI-SKID FAIL CIRCUIT
FAILURE MODE: OPEN OR SHORT CIRCUIT

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL BOX
- 4) ANTI-SKID FAIL CIRCUIT
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/3
LIFTOFF:	3/3	TAL: 3/3
ONORBIT:	3/3	AOA: 3/3
DEORBIT:	3/3	ATO: 3/3
LANDING/SAFING:	3/3	

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: 42-40314 HYDRO-AIRE, MC621-0055

CAUSES: FAILURE OF A RESISTOR, TRANSDUCER, BROKEN WIRE, ETC..

EFFECTS/RATIONALE:

CIRCUIT TO DETECT FAILURE MAY SHOW FAILURE WHEN THERE ISN'T ONE OR WON'T SHOW ONE WHEN THERE IS ONE. EITHER WAY, THIS BY ITSELF IS NOT A PROBLEM. COULD DESELECT A GOOD CIRCUIT OR VALVE RESULTING IN REDUCED BRAKING CAPABILITY.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 30110 ABORT: 1/1

ITEM: HYDRAULIC PRESSURE REGULATOR
FAILURE MODE: FAILS OPEN

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC PRESSURE REGULATOR
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	3/1R	ATO:	1/1
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 48-043, MC621-0055

CAUSES: BROKEN SPRING, CONTAMINATION

EFFECTS/RATIONALE:

3000PSI HYDRAULICS (S/B 1500PSI) BEING PROVIDED CAUSING HIGHER MODULATION ON BRAKING SYSTEM - TWO WHEELS. ON ABORT, EXTRA WEIGHT WILL CAUSE WHEEL BRAKEDOWN AND EXTRA PRESSURE.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 30111 ABORT: 2/1R

ITEM: HYD PRESS REG (SYS 2 & 3)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC PRESSURE REGULATOR
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	2/1R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 48-043, MC621-0055

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

NO EFFECT - SWITCHING VALVES WILL TRANSFER TO STANDBY SYSTEM.
THE FAILURE CAN BE DETECTED ON ORBIT WITH THE CIRC PUMPS
OPERATING. SEE MDAC IOA # 30129

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 30112 ABORT: 2/1R

ITEM: INLET FILTER, HYD MODULE ASSY
FAILURE MODE: CLOGGED FILTER (SYSTEM 2 & 3)

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) INLET FILTER
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	2/1R
LIFTOFF:	3/3		TAL:	2/1R
ONORBIT:	2/1R		AOA:	2/1R
DEORBIT:	2/1R		ATO:	2/1R
LANDING/SAFING:	2/1R			

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 33-017 HYDRO-AIRE, MC621-0055

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

NO EFFECT - SWITCHING VALVES WILL TRANSFER TO STANDBY SYSTEM.
THE FAILURE CAN BE DETECTED ON ORBIT WITH THE CIRC PUMPS
OPERATING. SEE MDAC IOA # 30130

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 30113 ABORT: 3/1R

ITEM: DISPLACEMENT LIMITER, HYD MODULE ASSY
FAILURE MODE: CLOGGED LINE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) DISPLACEMENT LIMITER
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	3/3		TAL:	3/1R
ONORBIT:	3/3		AOA:	3/1R
DEORBIT:	3/1R		ATO:	3/3
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 33-017 HYDRO-AIRE, MC621-0055

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF OR PARTIAL LOSS OF HALF BRAKING PRESSURE TO ONE WHEEL.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 30114 ABORT: 3/1R

ITEM: DISPLACEMENT LIMITER, HYD MODULE ASSY
FAILURE MODE: LEAKING LINE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) DISPLACEMENT LIMITER
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/3	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/3
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 33-017 HYDRO-AIRE, MC621-0055

CAUSES: BAD FITTING OR SEAL

EFFECTS/RATIONALE:

LOSS OF SOME HYDRAULIC FLUID, HOWEVER, LIMITER WILL LIMIT LOSS.
LOSS OF OR PARTIAL LOSS OF HALF BRAKING PRESSURE TO ONE WHEEL.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30115 ABORT: 3/3

ITEM: BY - PASS VALVE, HYD MODULE ASSY
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) BY - PASS VALVE
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 33-017 HYDRO-AIRE, MC621-0055

CAUSES: BROKEN SPRING, CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT - HYDRAULIC PRESSURE REMAINS AVAILABLE

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 30116 ABORT: 2/1R

ITEM: BY - PASS VALVE, HYD MODULE ASSY
FAILURE MODE: FAILS TO OPEN (SYSTEM 1)

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) BY - PASS VALVE
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/3	AOA:	2/1R
DEORBIT:	2/1R	ATO:	3/3
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 33-017 HYDRO-AIRE, MC621-0055

CAUSES: BROKEN SPRING, CONTAMINATION

EFFECTS/RATIONALE:

SYSTEM WILL SWITCH TO STANDBY SYSTEM IF PRESSURE ISN'T MAINTAINED
WITHIN LIMITS. SEE MDAC IOA # 30131

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 30117 ABORT: 1/1

ITEM: SELECTOR VALVE, HYD MODULE ASSY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) SELECTOR VALVE
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	1/1
LIFTOFF:	3/3		TAL:	1/1
ONORBIT:	3/3		AOA:	1/1
DEORBIT:	1/1		ATO:	3/3
LANDING/SAFING:	1/1			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 33-017 HYDRO-AIRE, MC621-0055

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

LEAK WILL DRAIN THE PRIMARY HYDRAULICS SYSTEM, THEN AFTER PRESSURE DROPS, DRAIN SECONDARY SYSTEM. WILL ONLY HAVE HALF BRAKING TO BOTH WHEELS.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 30118 ABORT: 3/1R

ITEM: SELECTOR VALVE, HYD MODULE ASSY
FAILURE MODE: JAMMED CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) SELECTOR VALVE
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/3	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/3
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 33-017 HYDRO-AIRE, MC621-0055

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
WON'T OPEN CAUSING LOSS OF HALF BRAKING TO BOTH WHEELS.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30119 ABORT: 3/3

ITEM: SELECTOR VALVE, HYD MODULE ASSY
FAILURE MODE: JAMMED OPEN

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) SELECTOR VALVE
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 33-017 HYDRO-AIRE, MC621-0055

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT UNLESS LOSS OF THE PRIMARY HYDRAULIC SYSTEM.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 30120 ABORT: 3/1R

ITEM: BRAKE / SKID CONTROL VALVE
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) BRAKE / SKID CONTROL VALVE
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/3	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/3
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: MC621-0055

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

RESULTING IN SYSTEM CLOSING DOWN VALVE - LOSS HALF BRAKING
CAPABILITY TO ONE TIRE.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 30121 ABORT: 1/1

ITEM: BRAKE / SKID CONTROL VALVE
FAILURE MODE: JAMMED OPEN

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) BRAKE / SKID CONTROL VALVE
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: MC621-0055

CAUSES: CONTAMINATION, FILTER CLOGGED, ORIFICE CLOGGED, ETC..

EFFECTS/RATIONALE:

CONTINUAL PRESSURE TO BRAKE RESULTING IN BRAKE / TIRE / WHEEL
DAMAGE AND LOSS OF CONTROL ON LANDING.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 30122 ABORT: 3/1R

ITEM: BRAKE / SKID CONTROL VALVE
FAILURE MODE: JAMMED CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE / SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) BRAKE / SKID CONTROL VALVE
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/3	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/3
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: MC621-0055

CAUSES: CONTAMINATION, FILTER CLOGGED, ORIFICE CLOGGED, ETC..

EFFECTS/RATIONALE:
LOSS OF HALF BRAKING CAPABILITY TO THAT ONE TIRE

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30123 ABORT: 3/3

ITEM: EXCITER RING - WHEEL SENSOR
FAILURE MODE: SHORT OR NO INPUT

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) EXCITER RING - WHEEL SENSOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	3/3		TAL:	3/3
ONORBIT:	3/3		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: MC621-0055

CAUSES: STRUCTURAL FAILURE, FOD, BROKEN WIRE

EFFECTS/RATIONALE:

NO WHEEL INFORMATION TO BRAKE / SKID CONTROL CIRCUIT, THEREFORE
NO SKID CONTROL. WILL DISABLE THE SYSTEM RESULTING IN LOSS OF
HALF BRAKING TO ONE WHEEL

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30123 ABORT: 3/3

ITEM: EXCITER RING - WHEEL SENSOR
FAILURE MODE: SHORT OR NO INPUT

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) EXCITER RING - WHEEL SENSOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	3/3		TAL:	3/3
ONORBIT:	3/3		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: MC621-0055

CAUSES: STRUCTURAL FAILURE, FOD, BROKEN WIRE

EFFECTS/RATIONALE:

NO WHEEL INFORMATION TO BRAKE / SKID CONTROL CIRCUIT, THEREFORE
NO SKID CONTROL. WILL DISABLE THE SYSTEM RESULTING IN LOSS OF
HALF BRAKING TO ONE WHEEL

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30123 ABORT: 3/3

ITEM: EXCITER RING - WHEEL SENSOR
FAILURE MODE: SHORT OR NO INPUT

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) EXCITER RING - WHEEL SENSOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: MC621-0055

CAUSES: STRUCTURAL FAILURE, FOD, BROKEN WIRE

EFFECTS/RATIONALE:

NO WHEEL INFORMATION TO BRAKE / SKID CONTROL CIRCUIT, THEREFORE
NO SKID CONTROL. WILL DISABLE THE SYSTEM RESULTING IN LOSS OF
HALF BRAKING TO ONE WHEEL

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30123 ABORT: 3/3

ITEM: EXCITER RING - WHEEL SENSOR
FAILURE MODE: SHORT OR NO INPUT

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) EXCITER RING - WHEEL SENSOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: MC621-0055

CAUSES: STRUCTURAL FAILURE, FOD, BROKEN WIRE

EFFECTS/RATIONALE:

NO WHEEL INFORMATION TO BRAKE / SKID CONTROL CIRCUIT, THEREFORE
NO SKID CONTROL. WILL DISABLE THE SYSTEM RESULTING IN LOSS OF
HALF BRAKING TO ONE WHEEL

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 30124 ABORT: 1/1

ITEM: STATORS, ROTORS, CLIPS
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) WHEEL AND BRAKE ASSEMBLY
- 3) STATORS, ROTORS, CLIPS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	HDW/FUNC	CRITICALITIES ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: MC621-0051

CAUSES: THERMAL, TORSION, HYDRAULIC RESONANCE, ETC..

EFFECTS/RATIONALE:

WHEEL LOCKUP CAUSING BLOWN TIRE AND POSSIBLE LOSS OF CREW AND
VEHICLE WITH HEAVY WEIGHT.

REFERENCES: 13.2 SSSH, JSC 12770 VOL. 10D, ORBITER BRAKE AD HOC
COMMITTEE VOL.I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 30125 ABORT: 1/1

ITEM: RUDDER / BRAKE PEDAL ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) FLIGHT CONTROLS
- 2) RUDDER / BRAKE PEDAL ASSEMBLY
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: V070-573001

CAUSES: OVERLOAD, CORROSION / CRACKING, PIECE-PART STRUCTURAL
FAILURE, MISHANDLING OR ABUSE

EFFECTS/RATIONALE:

A STRUCTURAL FALIURE OF THE RUDDER / BRAKE PEDAL ASSEMBLY THAT
CAUSED A BINDING OF THE CONTROLS WOULD CAUSE FLIGHT CONTROL
PROBLEMS DURING ENTRY THAT WOULD CAUSE A LOSS OF THE VEHICLE AND
THE CREW.

REFERENCES: V070-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 1/1
MDAC ID: 30126 ABORT: 1/1

ITEM: RUDDER / BRAKE PEDAL ASSEMBLY
FAILURE MODE: BINDING / JAMMING

LEAD ANALYST: W. WEISSINGER SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) FLIGHT CONTROLS
- 2) RUDDER / BRAKE PEDAL ASSEMBLY
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	1/1
ONORBIT:	3/3	AOA:	1/1
DEORBIT:	1/1	ATO:	1/1
LANDING/SAFING:	1/1		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER: V070-573001

CAUSES: DEBRIS, FOREIGN OBJECTS

EFFECTS/RATIONALE:

DEBRIS OR FOREIGN OBJECTS IN THE CONTROL SYSTEMS DURING DEORBIT OR LANDING OPERATIONS THAT CAUSED BINDING OR JAMMING OF THE CONTROLS COULD CAUSE THE VEHICLE TO BECOME UNCONTROLLABLE. A FAILURE OF THIS NATURE WOULD CAUSE A LOSS OF THE CREW AND VEHICLE.

REFERENCES: V070-573001

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/3
MDAC ID: 30127 ABORT: 3/3

ITEM: TRANSDUCERS, SENSORS (INSTRUMENTATION)
FAILURE MODE: FAILURE - NO DATA

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) LANDING / DECELERATION SUBSYSTEMS
- 2) TRANSDUCERS, SENSORS
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION: ORBITER CABIN AREA, FLIGHT CONTROL AREA
PART NUMBER:

CAUSES: CONTAMINATION, SHOCK

EFFECTS/RATIONALE:

ALL SENSOR TRANSDUCERS ON THE LANDING / DECELERATION SUBSYSTEM
ARE DOWNLIST DATA. FAILURE WILL ONLY RESULT IN THE LOSS OF DATA
EXCEPT FOR THE NOSE WHEEL STEERING DATA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 3/1R
MDAC ID: 30128 ABORT: 3/1R

ITEM: BRAKE HYDRAULIC LINE HEATERS
FAILURE MODE: BROKEN WIRE, THERMOSTAT FAILS OFF

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) MAIN LANDING GEAR COMPARTMENT
- 2) MAIN LANDING GEAR
- 3) BRAKE HYDRAULIC LINE HEATERS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/3	AOA:	3/1R
DEORBIT:	3/3	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: MC363-0044, MC363-0046

CAUSES: SHOCK CONTAMINATION

EFFECTS/RATIONALE:

HEATERS ARE USED TO KEEP TO KEEP THE HYDRAULIC FLUID WARM BETWEEN THE BRAKE / SKID CONTROL MODULE AND THE BRAKE MASTER CYLINDER. THE HEATERS HAVE TRIPLE REDUNDANCY ON EACH LINE.

REFERENCES: MC363-0044, MC363-0046

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 30129 ABORT: 2/1R

ITEM: HYD PRESS REG (SYS 1)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE SKID CONTROL MODULE
- 4) HYDRAULIC PRESSURE REGULATOR
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/3	AOA:	2/1R
DEORBIT:	2/1R	ATO:	3/3
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 48-043, MC621-0055

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

NO EFFECT - SWITCHING VALVES WILL TRANSFER TO THE STANDBY SYSTEM.
SEE MDAC IOA # 30111.

REFERENCES: 13.2 SSSH, JSC 12770 VOL.10D, ORBITER BRAKE AD HOC
COMMITTEE VOL. I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 30130 ABORT: 2/1R

ITEM: INLET FILTER, HYD MODULE ASSY (SYS 1)
FAILURE MODE: FILTER CLOGGED

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) INLET FILTER
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES	
FLIGHT PHASE	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 2/1R
LIFTOFF:	3/3	TAL: 2/1R
ONORBIT:	3/3	AOA: 2/1R
DEORBIT:	2/1R	ATO: 3/3
LANDING/SAFING:	2/1R	

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 33-017 HYDRO-AIRE, MC621-0055

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

NO EFFECT - SWITCHING VALVES WILL TRANSFER TO THE STANDBY SYSTEM.
SEE MDAC IOA # 30112.

REFERENCES: 13.2 SSSH, JSC 12770 VOL.10D, ORBITER BRAKE AD HOC
COMMITTEE VOL. I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: LANDING/DECELERATION SYSTEMS FLIGHT: 2/1R
MDAC ID: 30131 ABORT: 2/1R

ITEM: BY - PASS VALVE, HYD MODULE ASSY (SYS 2&3)
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: J. COMPTON SUBSYS LEAD: W. WEISSINGER

BREAKDOWN HIERARCHY:

- 1) BRAKES AND ANTI-SKID CONTROL SYSTEMS
- 2) SKID CONTROL SYSTEM
- 3) BRAKE SKID CONTROL MODULE
- 4) HYDRAULIC MODULE ASSEMBLY
- 5) BY - PASS VALVE
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	2/1R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MAIN LANDING GEAR COMPARTMENT
PART NUMBER: 33-017 HYDRO-AIRE, MC621-0055

CAUSES: BROKEN SPRING, CONTAMINATION

EFFECTS/RATIONALE:

SYSTEM WILL SWITCH TO STANDBY SYSTEM IF PRESSURE ISN'T MAINTAINED WITHIN LIMITS. A FAILURE OF THE SYSTEM WILL BE DETECTED ON ORBIT WITH THE CIRC PUMPS OPERATING. SEE MDAC IOA# 30116.

REFERENCES: 13.2 SSSH, JSC 12770 VOL.10D, ORBITER BRAKE AD HOC COMMITTEE VOL. I

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31100 ABORT: 3/3

ITEM: ISOLATION DIODE (12), 1 AMP
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANELS F6A5 & F8A5
- 3) ISOLATION DIODES (12, 6 PER PANEL F6A5 & F8A5)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PNLS F6A5 & F8A5 34V73A6A5-A1CR1,2,3,4,5,6
34V73A8A5-A1CR1,2,3,4,5,6
PART NUMBER: JANTXV1N4246

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

SUPPRESSOR DIODES TO LD GR EVENT INDICATOR COILS, LOSS OF EVENT
INDICATION NOT CRITICAL TO FLIGHT.

REFERENCES: VS70-510109 ZONES 4,7,82,84,101,103

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 2/1R
MDAC ID: 31101 ABORT: 2/1R

ITEM: PROXIMITY SENSOR BOX (2)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FORWARD MOTOR CONTROL ASSEMBLIES 2 AND 3
- 3) PROXIMITY SENSOR ELECTRONIC BOXES 1 & 2
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	2/1R	TAL:	2/1R
ONORBIT:	2/1R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: AREA 81 FWD AVIONICS BAY NO. 1, 81V51A1 AREA 82 FWD
AVIONICS BAY NO. 2, 82V51A2
PART NUMBER: MC452-0124-0009

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
ERRONEOUS INPUT, THERMAL STRESS

EFFECTS/RATIONALE:

PROVIDES THE ELECTRONICS FOR SENSING THE DISCRETE POSITION OF
MOVING PARTS/ASSEMBLIES WITHIN THE LANDING GEAR CONTROL SUB-
SYSTEM. PROVIDES POWER, REG., AMPLIFICATION, SELF-TEST &
SIGNALIZATION THROUGH CIRCUIT CARD CHANNELS TO DESIGNATED REMOTE
SENSORS.

INADVERTENT POWER OUTPUT FROM ONE OF TEN POSSIBLE CHANNELS WITHIN
ONE OF TWO PROXIMITY SWITCH PACKAGES. TWO FAILURES: (1) LOSS OF
REDUNDANT SENSOR BOX AND (2) MIGHT NOT FIRE NLG EXTENSION PYRO
BACKUP UPLOCK RELEASE EVEN IF HYD. SYSTEM RELEASED NLG.
LOSS OF LANDING GEAR PYRO ASSIST FUNCTION AFTER TWO FAILURES
COULD RESULT IN LOSS OF CREW/VEHICLE IF AIR LOADS PRECLUDE DOOR
OPENING DURING LANDING.

REFERENCES: VS70-510109 ZONES 6,12,18,78,84,91,102,109

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31102 ABORT: 3/1R

ITEM: PROXIMITY SENSOR BOX (2)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FORWARD MOTOR CONTROL ASSEMBLIES 2 AND 3
- 3) PROXIMITY SENSOR ELECTRONIC BOXES 1 & 2
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/1R	TAL:	3/1R
ONORBIT:	3/1R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: AREA 81 FWD AVIONICS BAY NO. 1, 81V51A1 AREA 82 FWD
AVIONICS BAY NO. 2, 82V51A2
PART NUMBER: MC452-0124-0009

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES THE ELECTRONICS FOR SENSING THE DISCRETE POSITION OF MOVING PARTS/ASSEMBLIES WITHIN THE LANDING GEAR CONTROL SUB-SYSTEM. PROVIDES POWER, REGULATION, AMPLIFICATION, SELF-TEST & SIGNALIZATION THROUGH CIRCUIT CARD CHANNELS TO DESIGNATED REMOTE SENSORS. LOSS OF OUTPUT ON BOTH SENSOR BOXES WILL NOT PREVENT THE FIRING OF NLG EXTENSION PYRO POWERED ASSIST WHEN COMMANDED, BUT WILL PREVENT THE FIRING OF NLG EXTENSION PYRO BACKUP UPLOCK RELEASE. HYD. SYSTEM WILL STILL EXTEND THE NLG. FUNCTIONAL CRITICALITY EFFECT - POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ABILITY TO EXTEND THE NLG.

REFERENCES: VS70-510109 ZONES 6,12,18,78,84,91,102,109

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31103 ABORT: 3/3

ITEM: ISOLATION DIODE (3), 1 AMP
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FPCA 1,2,3
- 3) ISOLATION DIODES (3), LDG 'ARM' STATUS/PWR MONITORS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FPCA - 1,2,3 81V76A22A1CR17, 82V76A23A1CR18,
83V76A24A1CR12
PART NUMBER: JANTXV1N4246

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES ISOLATION BETWEEN DIFFERENT MAIN DC BUSES SUPPLYING POWER TO MDM MONITORS AND PANEL ANNUNCIATORS THROUGH EACH 'ARM' RELAY. NOT CRITICAL TO VEHICLE OPERATION OR CREW SAFETY.

REFERENCES: VS70-510109 ZONES 33,37,39

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31104 ABORT: 3/3

ITEM: ISOLATION DIODE (3), 1 AMP
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FPCA 1,2,3
- 3) ISOLATION DIODES (3), LDG GR 'DOWN' STATUS/PWR MONITORS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	3/3		TAL:	3/3
ONORBIT:	3/3		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FPCA - 1,2,3 81V76A22A1CR18, 82V76A23A1CR17,
83V76A24A1CR13
PART NUMBER: JANTXV1N4246

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES ISOLATION BETWEEN DIFFERENT MAIN DC BUSES SUPPLYING POWER TO MDM MONITORS AND ANNUNCIATORS THROUGH EACH 'DOWN' RELAY. NOT CRITICAL TO VEHICLE OPERATION OR CREW SAFETY.

REFERENCES: VS70-510109 ZONES 33,37,39

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31105 ABORT: 3/3

ITEM: TRANSIENT SUPPRESSOR DIODE (4), 3 AMPS
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FPCA 1 & 2
- 3) TRANSIENT SUPPRESSOR DIODES (4)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FPCA 1&2 81V76A22-A1CR13, 81V76A22-A1CR14,
82V76A23-A1CR15, 82V76A23-A1CR16
PART NUMBER: JANTXVIN5551

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

LOSS OF TRANSIENT SUPPRESSION CAPABILITY. REPEATED CIRCUIT
OPERATION OF COILS WOULD POSSIBLY DAMAGE RELAY CONTACTS BECAUSE
OF ARCING CAUSED BY INDUCED VOLTAGE ON REMOVAL OF POWER FROM
SOLENOID COIL.

REFERENCES: VS70-510109 ZONES 58, 69

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31107 ABORT: 3/1R

ITEM: BLOCKING DIODE (2) 12 AMP, 400V
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA - 2 & 3
- 3) BLOCKING DIODES (2, 1 PER FPCA - 2 & 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD PCA 2 & 3 82V76A23-CR14 83V76A24-CR9
PART NUMBER: JANTX1N1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

DIODES ISOLATE RETURN BUSES BETWEEN FWD PCA 2 AND FWD PCA 3.
POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL POWER
TO REDUNDANT SHUTOFF VALVE.

REFERENCES: VS70-510109 ZONES 58,61

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31108 ABORT: 3/3

ITEM: BLOCKING DIODE (2) 12 AMP, 400V
FAILURE MODE: SHORTS, LOW RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA - 2 & 3
- 3) BLOCKING DIODES (2, 1 PER FPCA - 2 & 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA 2 & 3 82V76A23-CR14 83V76A24-CR9
PART NUMBER: JANTX1N1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

DIODES ISOLATE RETURN BUSES BETWEEN FWD PCA 2 AND FWD PCA 3.
POSSIBLE LOSS OF RETURN BUS ISOLATION BETWEEN FWD PCA NUMBERS 2 &
3 AND POSSIBLE CIRCULATING CURRENT BETWEEN FWD PCA 2 & 3.

REFERENCES: VS70-510109 ZONES 58,61

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31109 ABORT: 3/1R

ITEM: BLOCKING DIODE (2) 12 AMP
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA - 2 & 3
- 3) BLOCKING DIODES (2, 1 PER FPCA - 2 & 3), RPC POWER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD PCA 2 & 3 82V76A23-CR15 83V76A24-CR10
PART NUMBER: JANTX1N1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

ISOLATES TWO DIFFERENT MAIN DC BUS VOLTAGES AT THE RPC'S OUTPUT
FOR POWERING THE REDUNDANT SHUTOFF VALVE IN PARALLEL. POSSIBLE
LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL POWER TO
REDUNDANT SHUTOFF VALVE FROM AN RPC.

REFERENCES: VS70-510109 ZONES 57,61

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31110 ABORT: 3/3

ITEM: BLOCKING DIODE (2) 12 AMP, 400V
FAILURE MODE: SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA - 2 & 3
- 3) BLOCKING DIODES (2, 1 PER FPCA - 2 & 3), RPC POWER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA 2 & 3 82V76A23-CR15 83V76A24-CR10
PART NUMBER: JANTX1N1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

ISOLATES TWO DIFFERENT MAIN DC BUS VOLTAGES AT THE RPC'S OUTPUT
FOR POWERING THE REDUNDANT SHUTOFF VALVE IN PARALLEL. LOSS OF
UNIT CAPABILITY TO ISOLATE THE TWO RPC OUTPUTS.

REFERENCES: VS70-510109 ZONES 57,61

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31111 ABORT: 3/1R

ITEM: CIRCUIT BREAKERS (2), LG SENSORS
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANEL L4
- 3) CIRCUIT BREAKERS CB59 & CB62
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	/NA		TAL:	3/1R
ONORBIT:	/NA		AOA:	3/1R
DEORBIT:	3/1R		ATO:	3/1R
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: PANEL L4 31V73A4-CB59 31V73A4-CB62
PART NUMBER: MC454-0026-2030

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
VIBRATION

EFFECTS/RATIONALE:

PROVIDES CIRCUIT PROTECTION TO THE PROXIMITY SENSOR BOXES.
POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF LANDING GEAR
SENSOR INFORMATION. VISUAL POWER INDICATION FOR SENSOR BOXES.

REFERENCES: VS70-510109 ZONES 12,79

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31112 ABORT: 3/3

ITEM: CIRCUIT BREAKERS (2), LG SENSORS
FAILURE MODE: FAILS CLOSED, SHORTED CONTACTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANEL L4
- 3) CIRCUIT BREAKERS CB59 & CB62
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANEL L4 31V73A4-CB59 31V73A4-CB62
PART NUMBER: MC454-0026-2030

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
VIBRATION

EFFECTS/RATIONALE:

PROVIDES CIRCUIT PROTECTION TO THE PROXIMITY SENSOR BOXES.
FAILURE HAS NO EFFECT ON SUBSYSTEM.

REFERENCES: VS70-510109 ZONES 12,79

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31113 ABORT: 3/1R

ITEM: PUSHBUTTON SWITCH (2), LANDING GEAR DOWN
FAILURE MODE: FAILS OPEN (SWITCHES NORMALLY OPEN)

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANELS F6A5 & F8A5
- 3) LANDING GEAR DOWN PUSHBUTTON SWITCHES (2), ILLUMINATED
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PANELS F6A5 & F8A5 S2
PART NUMBER: ME452-0061-4145

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
VIBRATION

EFFECTS/RATIONALE:

PROVIDES REDUNDANT MANUAL 'ON' CONTROL OF 28VDC FROM CONTROL BUS TO LATCHING RELAYS FOR LANDING GEAR DOWN CIRCUIT; ACTUATION SWITCH LIGHT COMES ON WHEN PUSHED. TWO IDENTICAL SWITCHES PROVIDE REDUNDANT CONTROL BUS POWER TO COMMON LOAD. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL CONTROL POWER.

REFERENCES: VS70-510109 ZONES 27,31

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31114 ABORT: 3/3

ITEM: PUSHBUTTON SWITCH (2), LANDING GEAR DOWN
FAILURE MODE: FAILS CLOSED, SHORTED CONTACTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANELS F6A5 & F8A5
- 3) LANDING GEAR DOWN PUSHBUTTON SWITCHES (2), ILLUMINATED
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANELS F6A5 & F8A5 S2
PART NUMBER: ME452-0061-4145

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
VIBRATION

EFFECTS/RATIONALE:

PROVIDES REDUNDANT MANUAL 'ON' CONTROL OF 28VC FROM CONTROL BUS
TO LATCHING RELAYS FOR LANDING GEAR DOWN CIRCUIT. FAILURE POWERS
RELAY PICK UP COIL(S) AND LANDING GEAR DOWN CONTACTS ARE
ENERGIZED, SERIES CONTACTS PREVENT ACTUATION OF LANDING GEAR.
NO EFFECT ON CREW/VEHICLE.

REFERENCES: VS70-510109 ZONES 27,31

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31115 ABORT: 3/3

ITEM: LANDING GEAR TOGGLE SWITCH, S13
FAILURE MODE: FAILS OPEN (SWITCH NORMALLY OPEN), FAILS CLOSED

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANEL A12
- 3) LDG GEAR TOGGLE SWITCH (S13)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/3
LIFTOFF:	/NA	TAL: 3/3
ONORBIT:	/NA	AOA: 3/3
DEORBIT:	3/3	ATO: 3/3
LANDING/SAFING:	3/3	

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANEL A12 36V73A12-S13
PART NUMBER: ME452-0102-7256

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
VIBRATION

EFFECTS/RATIONALE:

PROVIDES MAINTAINED 'OFF' AND MOMENTARY 'ON' POWER TO THE LANDING GEAR ARM/DOWN RESET CIRCUIT. RESETS LATCHING RELAYS IN APPLICABLE CIRCUITS, THE USE OF RESET CIRCUIT IS NORMALLY A GROUND FUNCTION. FAILURE HAS NO EFFECT ON SUBSYSTEM. CB60 REMAINS OFF' UNTIL NEEDED.

REFERENCES: VS70-510109 ZONE 37

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31117 ABORT: 3/1R

ITEM: PUSHBUTTON SWITCH, LDG GR ARM, 4PDT, ILLUMINATED
FAILURE MODE: FAILS OPEN (SWITCHES NORMALLY OPEN)

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANELS F6A5 & F8A5
- 3) LANDING GEAR ARM PUSHBUTTON SWITCHES (2)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PANELS F6A5 & F8A5 34V73A6A5-S1 34V73A8A5-S1
PART NUMBER: ME452-0061-4146

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
VIBRATION

EFFECTS/RATIONALE:

PROVIDES REDUNDANT MANUAL 'ON' CONTROL OF 28VDC FROM CONTROL BUS TO LATCHING RELAYS FOR LANDING GEAR ARM CIRCUIT ACTUATION AND STATUS MONITORS. TWO IDENTICAL SWITCHES PROVIDE REDUNDANT CONTROL BUS POWER TO COMMON LOAD. SERIES CONTACT PREVENTS ACTUATION OF LANDING GEAR (DOWN CIRCUIT OPEN). POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL CONTROL POWER.

REFERENCES: VS70-510109 ZONES 43,47

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31118 ABORT: 3/3

ITEM: PUSHBUTTON SWITCH, LDG GR ARM, 4 PDT, ILLUMINATED
FAILURE MODE: FAILS CLOSED, SHORTED CONTACTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANELS F6A5 & F8A5
- 3) LANDING GEAR ARM PUSHBUTTON SWITCHES (2)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANELS F6A5 & F8A5 34V73A6A5-S1 34V73A8A5-S1
PART NUMBER: ME452-0061-4146

CAUSES: PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:

PROVIDES REDUNDANT MANUAL 'ON' CONTROL OF 28VDC FROM CONTROL BUS
TO LATCHING RELAYS FOR LANDING GEAR 'ARM' CIRCUIT.
FOR HW CRITICALITY - LOSS OF CAPABILITY TO REMOVE POWER FROM
RELAY SET (PICKUP) COIL, NO EFFECT ON CREW/VEHICLE.

REFERENCES: VS70-510109 ZONES 43,47

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31119 ABORT: 3/3

ITEM: EVENT INDICATORS (6)
FAILURE MODE: ERRATIC OPERATION, FAILS TO OPERATE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANELS F6 & F8
- 3) PANELS F6A5 & F8A5
- 4) EVENT INDICATORS (LANDING GEAR)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANELS F6A5 & F8A5 LG GR-NOSE(DS-1) LEFT (DS-2)
RIGHT (DS-3)-UP/DN
PART NUMBER: MC432-0222-0023

CAUSES: PIECE-PART STRUCTURAL, MECHANICAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES VISUAL INDICATION OF UP OR DOWN STATUS FOR THE
INDIVIDUAL OPERATION OF THE NOSE, LEFT, AND RIGHT LANDING GEAR.
THE UNIT 'BARBER POLES' WITHOUT POWER AND DISPLAYS THE APPLICABLE
POSITION WITH POWER APPLIED.

REFERENCES: VS70-510109 ZONES 4,7,81,84,100,103

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31120 ABORT: 3/3

ITEM: BLOCKING DIODE (6) 3 AMP
FAILURE MODE: SHORTS, LOW RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FLCA - 2 & 3
- 3) BLOCKING DIODES (6)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FLCA 2 & 3 82V76A17CR (3) 83V76A18CR (3)
PART NUMBER: JANTXV1N5551

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

LOSS OF HYBRID DEVICE CONTROLLER LEAKAGE CURRENT PREVENTION TO
NLG, RMG, & LMG BRAKE UPLOCK RELEASE PIC'S 1 & 2. NOT CRITICAL
TO CREW/VEHICLE.

REFERENCES: VS70-510109 ZONES 13,19,54,63,85,94

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31121 ABORT: 3/1R

ITEM: BLOCKING DIODE (6) 3 AMP
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FLCA - 2 & 3
- 3) BLOCKING DIODES (6)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: FLCA 2 & 3 82V76A17CR (3) 83V76A18CR (3)
PART NUMBER: JANTXV1N5551

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

LOSS OF ARM SIGNAL TO PIC'S FOR NLG, RMG, & LMG 'BACKUP' UPLOCK
RELEASE MECHANISMS, CAUSING POSSIBLE LOSS OF CREW/VEHICLE.

REFERENCES: VS70-510109 ZONES 13,19,54,63,85,94

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31122 ABORT: 3/3

ITEM: BLOCKING DIODE (2) 1 AMP
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA2
- 3) BLOCKING DIODES (2), POSITION INDICATOR PWR LG STRUT ACTUATORS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/3
LIFTOFF:	3/3	TAL: 3/3
ONORBIT:	3/3	AOA: 3/3
DEORBIT:	3/3	ATO: 3/3
LANDING/SAFING:	3/3	

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA2 82V76A23A1-CR19 82V76A23A1-CR20
PART NUMBER: JANTXV1N4246

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

MONITORING FUNCTION NOT CRITICAL TO VEHICLE OR CREW.

REFERENCES: VS70-510109 ZONE 140

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31123 ABORT: 3/3

ITEM: CIRCUIT BREAKER (3 AMP)
FAILURE MODE: FAILS OPEN (CB NORMALLY OPEN), FAILS CLOSED

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANEL R15
- 3) CIRCUIT BREAKER (3 AMP), LG ARM/DN RESET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANEL R15 32V73A15-CB60
PART NUMBER: MC454-0026-2030

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK,
VIBRATION

EFFECTS/RATIONALE:

PROVIDES CIRCUIT PROTECTION BETWEEN BUS 1BC AND THE LANDING GEAR
ARM/DN RESET LATCHING RELAYS. NO EFFECT, CIRCUIT BREAKER
NORMALLY OPEN, EXCEPT FOR GROUND TEST. MANUAL SWITCH PREVENTS
PREMATURE RESET OF RELAYS.

REFERENCES: VS70-510109 ZONE 37

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/13/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31125 ABORT: 3/1R

ITEM: GENERAL PURPOSE FUSE (5 AMP)
FAILURE MODE: OPENS, PREMATURELY OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) LANDING GEAR ARM CIRCUIT
- 3) FWD PCA NO. 1
- 4) GENERAL PURPOSE FUSE (5 AMP)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [F] C [P]

LOCATION: FWD PCA-1 81V76A22-F9
PART NUMBER: ME451-0009-1021

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION, CHEMICAL
DEGRADED MATERIALS

EFFECTS/RATIONALE:

PROVIDES OVERLOAD PROTECTION TO LANDING GEAR CONTROL ("ALL LDG GR
DOWN") AND PUMP VALVES. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF
LOSS OF ELECTRICAL POWER.

REFERENCES: VS70-510109 ZONE 69

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/13/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31126 ABORT: 3/1R

ITEM: GENERAL PURPOSE FUSE, (8), 1 AMP
FAILURE MODE: OPENS, PREMATURELY OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANELS F6A5 & F8A5
- 3) GENERAL PURPOSE FUSES (8)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [F] C [P]

LOCATION: PANELS F6A5 & F8A5 34V73A6A5-F5,F7,F6,F8
34V73A8A5-F5,F7,F6,F8
PART NUMBER: ME451-0018-0100

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION, CHEMICAL
DEGRADED MATERIALS

EFFECTS/RATIONALE:

PROVIDES OVERLOAD PROTECTION TO THE MAIN LANDING GEAR "DOWN"
CONTROL CIRCUIT. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS
OF CONTROL ELECTRICAL POWER.

REFERENCES: VS70-510109 ZONES 27,32

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/13/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31127 ABORT: 3/1R

ITEM: GENERAL PURPOSE FUSE (1 AMP)
FAILURE MODE: OPENS, PREMATURELY OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANELS F6A5 & F8A5
- 3) GENERAL PURPOSE FUSES (8); 1 AMP, LANDING GEAR "ARM" CKT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [F] C [P]

LOCATION: PANELS F6A5 & F8A5 34V73A6A5-F1,F2,F3,F4
34V73A8A5-F1,F2,F3,F4
PART NUMBER: ME451-0018-0100

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION, CHEMICAL
DEGRADED MATERIALS

EFFECTS/RATIONALE:

PROVIDES OVERLOAD PROTECTION TO THE MAIN LANDING GEAR "ARM"
CONTROL CIRCUIT. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS
OF CONTROL BUS ELECTRICAL POWER.

REFERENCES: VS70-510109 ZONES 43,47

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31128 ABORT: 3/1R

ITEM: RESISTOR (12), 10.2 OHMS, 2W
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FLCA 2 & 3
- 3) RESISTOR (12), PIC ARM CIRCUITS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [F] C [P]

LOCATION: FLCA 2 & 3 82V76A17-R(6) 83V76A18-R(6)
PART NUMBER: RWR80S10R2BR

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES CURRENT LIMITING BETWEEN HDC "ARM" SIGNAL OUTPUT AND THE
LANDING GEAR PIC'S. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF
LOSS OF PIC ARM CAPABILITY.

REFERENCES: VS70-510109 ZONES 13,19,54,63,85,94

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31129 ABORT: 3/3

ITEM: RESISTOR (12), 10.2 OHMS, 2W
FAILURE MODE: SHORTS, LOW RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FLCA 2 & 3
- 3) RESISTOR (12), PIC ARM CIRCUITS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FLCA 2 & 3 82V76A17-R(6) 83V76A18-R(6)
PART NUMBER: RWR80S10R2BR

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES CURRENT LIMITING BETWEEN HDC "ARM" SIGNAL OUTPUT AND THE LANDING GEAR PIC'S. FAILS SHORTED CONDITION WOULD STILL CONDUCT "ARM" SIGNAL TO PIC ARM CIRCUITRY EVEN THOUGH PIC OVERCURRENT PROTECTION HAS BEEN LOST.

REFERENCES: VS70-510109 ZONES 13,19,54,63,85,94

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31130 ABORT: 3/3

ITEM: ISOLATION RESISTORS (18); 5.1K, 1/4W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) VARIOUS MDM MONITORING CIRCUITS
- 3) ISOLATION RESISTOR (18)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: VARIOUS LOCATIONS
PART NUMBER: RLR0705101GR

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION, CHEMICAL
DEGRADED MATERIALS

EFFECTS/RATIONALE:
LIMITS CURRENT IN LDG GEAR SENSING CONTROL, AND POWER MONITORING
CIRCUITS BETWEEN LINE TO MDM'S FOR LDG GEAR CONTROL SUBSYSTEM.
NONCRITICAL FUNCTION.

REFERENCES: VS70-510109

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31131 ABORT: 3/3

ITEM: RESISTOR, 7.5K, 2W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PNL A12
- 3) RESISTOR, 7.5K, 2W
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PNL A12 36V73A12-A13-R1
PART NUMBER: RLR42C7501GM

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

LIMITS CURRENT IN THE ARM/DN RESET POWER STATUS CIRCUIT BETWEEN
ESSENTIAL BUS AND MDM MONITORING CIRCUIT.

REFERENCES: VS70-510109 ZONE 37

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31132 ABORT: 3/3

ITEM: RESISTOR (3), 1.2K, 2W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA 1,2,3
- 3) RESISTOR (3), ARM STATUS/MONITOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA 1,2,3 81V76A22-A1R93 82V76A23-A1R99
83V76A24-A1R86
PART NUMBER: RWR80S1211FR

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES CIRCUIT PROTECTION BY LIMITING CURRENT BETWEEN A MAIN DC
BUSS AND "ARM" RELAY MONITORING CIRCUITS. NONCRITICAL FUNCTION.

REFERENCES: VS70-510109 ZONES 33,36,39

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31133 ABORT: 3/3

ITEM: RESISTOR (6), 100K, 1/8W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FLCA 2 & 3
- 3) RESISTOR (6), GSE TEST CIRCUITS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/3
LIFTOFF:	3/3	TAL: 3/3
ONORBIT:	3/3	AOA: 3/3
DEORBIT:	3/3	ATO: 3/3
LANDING/SAFING:	3/3	

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FLCA 2 & 3
PART NUMBER: RLR05C1003GR

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

LIMITS CURRENT BETWEEN ORBITER GSE TEST CONNECTIONS AND TESTING OF ORBITER LANDING GEAR UPLOCK CIRCUITRY. GROUND TEST ONLY, NONCRITICAL FUNCTION.

REFERENCES: VS70-510109 ZONES 8,81,104

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31134 ABORT: 3/3

ITEM: RESISTOR (2), 1.8K, 1/4W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA 1,2,3
- 3) RESISTOR (2), BLEED-OFF, RPC/MDM MONITORING
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA 2 & 3 82V76A23-A1R80 83V76A24-A1R74
PART NUMBER: RLRC7C1801GR

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES A BLEED-OFF LINE TO THE RETURN BUSS IN CASE OF A LEAKING BLOCKING DIODE IF THE ALTERNATE PARALLEL RPC IS USED TO POWER THE REDUNDANT SHUTOFF VALVE. ALSO PREVENTS FALSE TRIGGERING OF MDM'S OF2 OR OF3.

REFERENCES: VS70-510109 ZONES 57,60

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31135 ABORT: 3/3

ITEM: RESISTOR (8), 17.4K, 1/4W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FLCA 1 & 2
- 3) RESISTOR (8), GSE PROX. SENSOR BOX 1 & 2
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES	
FLIGHT PHASE	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/3
LIFTOFF:	3/3	TAL: 3/3
ONORBIT:	3/3	AOA: 3/3
DEORBIT:	3/3	ATO: 3/3
LANDING/SAFING:	3/3	

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FLCA 1 & 2 81V76A16-R(4) 82V76A17-R(4)
PART NUMBER: RBR54L17401BR

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

LIMITS CURRENT BETWEEN GSE COMMANDS AND PROX. SENSOR BOXES WHEN
PERFORMING GROUND TARGET TEST.

REFERENCES: VS70-510109 ZONES 9,76

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31136 ABORT: 3/3

ITEM: RESISTOR (3), 1.2K, 2W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA 1,2,3
- 3) RESISTOR (3), DOWN STATUS/MONITOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA 1,2,3 81V76A22-A1R94 82V76A23-A1R98
83V76A24-A1R87
PART NUMBER: RWR80S1211FR

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES CIRCUIT PROTECTION BY LIMITING CURRENT BETWEEN A MAIN DC BUSS AND "DOWN" RELAY MONITORING CIRCUITS. NONCRITICAL FUNCTION.

REFERENCES: VS70-510109 ZONES 31,36,39

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 2/1R
MDAC ID: 31137 ABORT: 2/1R

ITEM: GENERAL PURPOSE FUSE (2), 5 AMP
FAILURE MODE: OPENS, PREMATURELY OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FPCA 2 & 3
- 3) FUSE (2), 5 AMP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	/NA	TAL:	2/1R
ONORBIT:	/NA	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FPCA 2 & 3 82V76A23-F24 83V76A24-F6
PART NUMBER: ME451-0018-0500

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION, CHEMICAL
DEGRADED MATERIALS

EFFECTS/RATIONALE:

PROVIDES OVERLOAD PROTECTION BETWEEN A MAIN DC BUS AND THE
LANDING GEAR SUBSYSTEM LOADS CONSISTING OF PIC'S - 1 & 2 FIRING
CIRCUITS FOR: PYRO UPLOCK RELEASE NLG PYRO ASSIST AND REDUNDANT
SHUTOFF VALVE. LOSS OF REDUNDANT POWER AND NLG MAY FAIL TO
EXTEND IN REQUIRED TIME RESULTING IN CREW/VEHICLE LOSS.

REFERENCES: VS70-510109 ZONES 56,62

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31138 ABORT: 3/3

ITEM: RESISTOR (2), 2.2K, 1/2W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA 2 & 3
- 3) RESISTOR (2), RPC OUTPUT/MDM MONITOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA 2 & 3 82V76A23-A1R45 83V76A24-A1R42
PART NUMBER: RLR20C2201GR

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

LIMITS CURRENT BETWEEN RPC OUTPUT AND MDM MONITORING FOR RPC
OPERATING STATUS.

REFERENCES: VS70-510109 ZONES 57,60

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31139 ABORT: 3/3

ITEM: RESISTOR, 1.2K, 2W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA 2
- 3) RESISTOR, 1.2K, 2W
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA 2 82V76A23-A1R88
PART NUMBER: RWR8051211FR

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

LIMITS CURRENT IN LANDING GEAR STRUT ACTUATOR POSITION INDICATORS
FOR NLG, LMG, AND RMG DOOR BOOSTER SPRING LOCKS AND SHUTTLE VALVE
INDICATORS.

REFERENCES: VS70-510109 ZONE 140

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31140 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA 2 & 3
- 3) HYBRID DRIVER CONTROLLER (2), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: FWD LCA 2 & 3 82V76A17-AR 83V76A18-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE "NLG NO-WOW" SIGNAL IS RECEIVED THROUGH A PROX. SENSOR ELE. BOX, THE HDC CONNECTS MAIN DC BUSS POWER TO WOW CIRCUITS WITHIN A BRAKE/SKID CONTROL BOX AND SIGNALS A MONITORING MDM. POSSIBLE LOSS OF CREW/VEHICLE WITH LOSS OF CAPABILITY TO SEND "NLG NO-WOW" SIGNALS TO BRAKE/SKID BOXES A AND B.

REFERENCES: VS70-510109 ZONES 103,110 VS70-520109

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31141 ABORT: 3/3

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA 2 & 3
- 3) HYBRID DRIVER CONTROLLER (2), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD LCA 2 & 3 82V76A17-AR 83V76A18-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE "NLG NO-WOW" SIGNAL IS RECEIVED THROUGH A PROX. SENSOR ELE. BOX, THE HDC CONNECTS MAIN DC BUSS POWER TO WOW CIRCUITS WITHIN A BRAKE/SKID CONTROL BOX AND SIGNAL A MONITORING MDM. PREMATURELY CONDUCTS ONE OF TWO "NLG NO-WOW" SIGNALS TO BRAKE AND ANTI-SKID SUBSYSTEM; NO EFFECT.

REFERENCES: VS70-510109: ZONES 103,110; VS70-520109

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31142 ABORT: 3/3

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT, INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA-2
- 3) HYBRID DRIVER CONTROLLER, TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD LCA-2 82V76A17-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE NLG DOWNLOCKED SIGNAL IS RECEIVED THROUGH A PROX. SENSOR ELE. BOX, THE HDC CONNECTS A MAIN DC BUSS POWER TO DOWN COILS OF THE TWO NOSE LANDING GEAR EVENT INDICATORS AND SIGNAL A MONITORING MDM. NONCRITICAL MONITOR.

REFERENCES: VS70-510109 ZONE 101

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31143 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA-2
- 3) HYBRID DRIVER CONTROLLER, TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	/NA		TAL:	3/1R
ONORBIT:	/NA		AOA:	3/1R
DEORBIT:	3/1R		ATO:	3/1R
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: FWD LCA-2 82V76A17-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE NLG UNLOCKED SIGNAL IS RECEIVED THROUGH A PROX. SENSOR ELE. BOX, THE HDC CONNECTS MAIN DC BUSS POWER FOR ARMING LOGIC TO NLG UPLK PIC #2 AND NLG UNLOCK AND EVENT INDICATORS, AND SIGNALS A MONITORING MDM. POSSIBLE LOSS OF CREW/VEHICLE WITH LOSS OF CAPABILITY TO CONDUCT POWER TO ARM PIC-2.

REFERENCES: VS70-510109 ZONE 104

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 2/1R
MDAC ID: 31144 ABORT: 2/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA-2
- 3) HYBRID DRIVER CONTROLLER, TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	/NA	TAL:	2/1R
ONORBIT:	/NA	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: FWD LCA-2 82V76A17-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE NLG UNLOCKED SIGNAL IS RECEIVED THROUGH A PROX. SENSOR ELE. BOX, THE HDC CONNECTS MAIN DC BUSS POWER FOR ARMING LOGIC TO NLG UPLK PIC #2 AND NLG UNLOCK AND EVENT INDICATORS AND SIGNAL A MONITORING MDM. POSSIBLE LOSS OF CREW/VEHICLE WITH LOSS OF CAPABILITY TO ASSIST NLG EXTENSION.

REFERENCES: VS70-510109 ZONE 104

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31145 ABORT: 3/3

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT, INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA 2 & 3
- 3) HYBRID DRIVER CONTROLLER (4), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	HDW/FUNC
PRELAUNCH:	3/3	ABORT	
LIFTOFF:	/NA	RTLS:	3/3
ONORBIT:	/NA	TAL:	3/3
DEORBIT:	3/3	AOA:	3/3
LANDING/SAFING:	3/3	ATO:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD LCA 2 & 3 82V76A17-AR(2) 83V76A18-AR(2)
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE LEFT/RIGHT MG UPLOCK AND/OR MG DOOR UPLOCK SIGNALS ARE RECEIVED THROUGH A PROX. SENSOR ELE. BOX, THE HDC CONNECTS MAIN DC BUSS POWER TO THE RELATED MONITORING FUNCTIONS (I.E. LEFT/RIGHT MG EVENT INDICATORS, AND MDM'S. LOSS OF CAPABILITY: (1) TO ENERGIZE EVENT INDICATORS (DS2 & DS3) AND (2) SIGNAL STATUS TO AN MDM. ALTERNATE MONITORING STATUS PROVIDED.

REFERENCES: VS70-510109 ZONES 8,18,81,94

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31146 ABORT: 3/3

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT, INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA 2 & 3
- 3) HYBRID DRIVER CONTROLLER (2), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD LCA 2 & 3 82V76A17-AR(2) 83V76A18-AR(2)
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE LEFT/RIGHT MG DOWNLOCKED SIGNAL IS RECEIVED THROUGH A PROX. SENSOR ELE. BOX, THE HDC CONNECTS MAIN DC BUSS POWER TO THE DOWN COILS OF THE LEFT/RIGHT MG EVENT INDICATORS AND SIGNALS A MONITORING MDM. NONCRITICAL MONITOR.

REFERENCES: VS70-510109 ZONES 5,84

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31147 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA 3
- 3) HYBRID DRIVER CONTROLLER, TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	/NA		TAL:	3/1R
ONORBIT:	/NA		AOA:	3/1R
DEORBIT:	3/1R		ATO:	3/1R
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: FWD LCA-3 83V76A18-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE NLG DOOR UNLOCKED SIGNAL IS RECEIVED THROUGH A PROX. SENSOR ELE. BOX, THE HDC CONNECTS MAIN DC BUSS POWER FOR ARMING LOGIC TO PIC #1 AN NLG UNLOCK AND EVENT INDICATORS, AND SIGNALS A MONITORING MDM. POSSIBLE LOSS OF CREW/VEHICLE WITH LOSS OF CAPABILITY TO CONDUCT POWER TO ARM PIC-1.

REFERENCES: VS70-510109 ZONE 109

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31148 ABORT: 3/3

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT, INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA-2
- 3) HYBRID DRIVER CONTROLLER, TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD LCA-2 82V76A17-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE NLG UPLOCK AND NLG DOOR UPLOCK SIGNALS ARE RECEIVED THROUGH A PROX. SENSOR ELE. BOX, THE HDC CONNECTS MAIN DC BUSS POWER TO "UP" COILS OF NLG EVENT INDICATORS, AND SIGNALS A MONITORING MDM. NONCRITICAL MONITORING FUNCTION.

REFERENCES: VS70-510109 ZONE 106

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 2/1R
MDAC ID: 31149 ABORT: 2/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA-3
- 3) HYBRID DRIVER CONTROLLER, TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	/NA	TAL:	2/1R
ONORBIT:	/NA	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: FWD LCA-3 83V76A18-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE NLG DOOR UNLOCKED SIGNAL IS RECEIVED THROUGH A PROX. SENSOR ELE. BOX, THE HDC CONNECTS MAIN DC BUSS POWER FOR ARMING LOGIC TO PIC #1 AND NLG UNLOCK AND EVENT INDICATORS, AND SIGNALS A MONITORING MDM. POSSIBLE LOSS OF CREW/VEHICLE WITH LOSS OF CAPABILITY TO ASSIST NLG EXTENSION.

REFERENCES: VS70-510109 ZONE 109

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 2/1R
MDAC ID: 31150 ABORT: 2/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (4), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	/NA	TAL:	2/1R
ONORBIT:	/NA	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR(2) 83V76A18-AR(2)
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

AFTER RECEIVING THE NLG "DOWN" STIMULI, THE HDC'S CONDUCT "FIRE" COMMAND TO NLG PIC'S 1 & 2 FIRE-1 & FIRE-2 CIRCUITS FOR CHARGE INITIATION OF NLG EXTENSION POWERED ASSIST SUBSYSTEM. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF SECOND FAILURE; NLG MAY FAIL TO EXTEND IN THE REQUIRED TIME.

REFERENCES: VS70-510109 ZONES 127,130

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31151 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (4), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR(2) 83V76A18-AR(2)
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

AFTER RECEIVING THE NLG "DOWN" STIMULI, THE HDC'S CONDUCT "FIRE" COMMANDS TO NLG PIC'S 1 & 2 FIRE-1 & FIRE-2 CIRCUITS FOR CHARGE INITIATION OF NLG EXTENSION POWERED ASSIST SUBSYSTEM. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF PREMATURE COMPLETION OF PIC FIRING SEQUENCE.

REFERENCES: VS70-510109 ZONES 127,130

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 2/1R
MDAC ID: 31152 ABORT: 2/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE II)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (4), TYPE II
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	/NA	TAL:	2/1R
ONORBIT:	/NA	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR(2) 83V76A18-AR(2)
PART NUMBER: MC477-0262-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE "ARM & DOWN" SIGNALS ARE RECEIVED, THE HDC CONNECTS INPUT POWER (AFTER A ONE SECOND DELAY) TO THE FIRE-1 CIRCUIT AND SIGNALS A SERIES HDC WHICH DELAYS FIRE-2 COMMAND FOR ONE SECOND. THEN A SIGNAL IS SENT TO THE ASSOCIATED PIC FOR NLG EXTENSION POWERED ASSIST FUNCTION. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF SECOND FAILURE; THE NLG MAY FAIL TO EXTEND IN REQUIRED TIME.

REFERENCES: VS70-510109 ZONES 127,130

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31153 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE II)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (4), TYPE II
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	/NA		TAL:	3/1R
ONORBIT:	/NA		AOA:	3/1R
DEORBIT:	3/1R		ATO:	3/1R
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR(2) 83V76A18-AR(2)
PART NUMBER: MC477-0262-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE "ARM & DOWN" SIGNALS ARE RECEIVED, THE HDC CONNECTS INPUT POWER (AFTER A ONE SECOND DELAY) TO THE FIRE-1 CIRCUIT AND SIGNALS A SERIES HDC WHICH DELAYS FIRE-2 COMMAND FOR ONE SECOND. THEN A SIGNAL IS SENT TO THE ASSOCIATED PIC FOR NLG EXTENSION POWERED ASSIST FUNCTION. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF PREMATURE COMPLETION OF PIC FIRING SEQUENCE.

REFERENCES: VS70-510109 ZONES 127,130

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31154 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 3)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (2), TYPE III
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR 83V76A18-AR
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN ARM & DOWN COMMANDS ARE RECEIVED BY NLG PIC'S 1 & 2, THE HDC CONNECTS INPUT POWER TO THE PIC'S ARM LOGIC AND ENABLES THE FIRE-2 AND PYRO ASSIST FOR NLG EXTENSION. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL POWER TO ARM PIC'S.

REFERENCES: VS70-510109 ZONES 54,63

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31155 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 3)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (2), TYPE III
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR 83V76A18-AR
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN ARM & DOWN COMMANDS ARE RECEIVED BY NLG PIC'S 1 & 2, THE HDC CONNECTS INPUT POWER TO THE PIC'S ARM LOGIC AND ENABLES THE FIRE-2 AND PYRO ASSIST FOR NLG EXTENSION. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF PREMATURE COMPLETION OF PIC FIRING SEQUENCE.

REFERENCES: VS70-510109 ZONES 54,63

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31156 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (6), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR(3) 83V76A18-AR(3)
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN FIRE COMMAND IS RECEIVED, THE HDC CONNECTS DC INPUT POWER TO THE FIRING CIRCUIT WITHIN A PIC. THE HDC'S ARE USED FOR THE FIRING CIRCUIT (FIRE-1) FOR THE LANDING GEAR PIC'S. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL POWER TO FIRE PIC'S.

REFERENCES: VS70-510109 ZONES 16,21,54,63,88,96

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31157 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (6), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR(3) 83V76A18-AR(3)
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN FIRE COMMAND IS RECEIVED, THE HDC CONNECTS DC INPUT POWER TO THE FIRING CIRCUIT WITH A PIC. THE HDC'S ARE USED FOR THE FIRING CIRCUIT (FIRE-1) FOR THE LANDING GEAR PIC'S. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF PREMATURE COMPLETION OF PIC FIRING SEQUENCE.

REFERENCES: VS70-510109 ZONES 16,21,54,63,88,96

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31158 ABORT: 3/3

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT, INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (2), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD LCA - 2 & 3 82V76A17-AR 83V76A18-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE LEFT/RIGHT (MG-NO-WOW) SIGNAL IS RECEIVED THROUGH A PROX. SENSOR ELE. BOX, THE HDC CONNECTS A MAIN DC BUSS POWER FOR STATUS INDICATION OF LEFT/RIGHT MG-NO-WOW, AND THEN SIGNALS A MONITORING MDM. NONCRITICAL MONITOR.

REFERENCES: VS70-510109 ZONES 7,80

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31159 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE II)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (2), TYPE II
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	/NA		TAL:	3/1R
ONORBIT:	/NA		AOA:	3/1R
DEORBIT:	3/1R		ATO:	3/1R
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD LCA 82V76A17-AR 83V76A18-AR
PART NUMBER: MC477-0262-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE "ARM", "DOWN", AND "NLG UPLOCK" SIGNALS ARE RECEIVED, THE HDC CONNECTS INPUT POWER (AFTER A ONE SECOND DELAY) TO THE FIRE-2 SIGNAL INPUT OF THE "NLG BACKUP UPLOCK RELEASE" CIRCUITRY OF A NLG PIC. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF FIRE-2 SIGNAL TO ONE OF THE TWO PIC'S.

REFERENCES: VS70-510109 ZONES 54,63

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31160 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE II)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (2), TYPE II
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD LCA 82V76A17-AR 83V76A18-AR
PART NUMBER: MC477-0262-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE "ARM", "DOWN", AND "NLG UPLOCK" SIGNALS ARE RECEIVED, THE HDC CONNECTS INPUT POWER (AFTER A ONE SECOND DELAY) TO THE FIRE-2 SIGNAL INPUT OF THE "NLG BACKUP UPLOCK RELEASE" CIRCUITRY OF A NLG PIC. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF PREMATURE CONDUCTION OF ONE OF TWO REQUIRED SIGNALS TO THE FIRE-2 LOGIC CIRCUITS.

REFERENCES: VS70-510109 ZONES 54,63

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31161 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA-2
- 3) HYBRID DRIVER CONTROLLER, TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [4] B [F] C [P]

LOCATION: FWD LCA-2 82V76A17-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

THE HDC CONNECTS MAIN BUS DC POWER TO "WOW2" CIRCUITS WITHIN BRAKE/SKID CONTROL BOX A. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF CAPABILITY TO SEND "NLG NO-WOW2" SIGNAL TO BRAKE/SKID CONTROL BOX A.

REFERENCES: VS70-510109 ZONE 102

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31162 ABORT: 3/3

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA-2
- 3) HYBRID DRIVER CONTROLLER, TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD LCA-2 82V76A17-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

THE HDC CONNECTS MAIN BUS DC POWER TO "WOW2" CIRCUITS WITHIN BRAKE/SKID CONTROL BOXES. PREMATURELY CONDUCTS POWER TO ANOTHER HDC (WHICH IS INHIBITED), WHICH HAS NO EFFECT ON IT.

REFERENCES: VS70-510109 ZONE 102

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31163 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE II)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (4), TYPE II
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	/NA		TAL:	3/1R
ONORBIT:	/NA		AOA:	3/1R
DEORBIT:	3/1R		ATO:	3/1R
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [4] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR(2) 83V76A18-AR(2)
PART NUMBER: MC477-0262-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE "ARM & DOWN" SIGNALS ARE RECEIVED, THE HDC (AFTER A 1 SECOND DELAY) CONNECTS INPUT POWER TO THE FIRE-2 CIRCUIT OF THE LEFT/RIGHT EMERGENCY UPLOCK RELEASE ON PIC'S 1 & 2. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL POWER TO SEND FIRE-2 COMMAND TO LEFT/RIGHT PIC'S 1 & 2.

REFERENCES: VS70-510109 ZONES 14,20,87,94

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31164 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE II)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (4), TYPE II
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [4] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR(2) 83V76A18-AR(2)
PART NUMBER: MC477-0262-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN THE "ARM & DOWN" SIGNALS ARE RECEIVED, THE HDC (AFTER A 1 SECOND DELAY) CONNECTS INPUT POWER TO THE FIRE-2 CIRCUIT OF THE LEFT/RIGHT EMERGENCY UPLOCK RELEASE ON PIC'S 1 & 2. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF PREMATURE COMPLETION OF PIC FIRING SEQUENCE.

REFERENCES: VS70-510109 ZONES 14,20,87,94

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31165 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE III)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (4), TYPE III
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [4] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR(2) 83V76A18-AR(2)
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN LEFT/RIGHT UPLOCKED SIGNALS ARE RECEIVED, THE HDC CONNECTS INPUT POWER TO "ARM" CIRCUIT OF LEFT/RIGHT MAIN GEAR UPLOCK RELEASE PIC'S 1 & 2. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL POWER TO SEND ARM COMMAND TO LEFT/RIGHT PIC'S 1 & 2.

REFERENCES: VS70-510109 ZONES 12,19,85,93

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31166 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE III)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (4), TYPE III
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [4] B [F] C [P]

LOCATION: FWD LCA - 2 & 3 82V76A17-AR(2) 83V76A18-AR(2)
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

WHEN LEFT/RIGHT UNLOCKED SIGNALS ARE RECEIVED, THE HDC CONNECTS INPUT POWER TO "ARM" CIRCUIT OF LEFT/RIGHT MAIN GEAR UNLOCK RELEASE PIC'S 1 & 2. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF PREMATURE COMPLETION OF PIC ARM SEQUENCE.

REFERENCES: VS70-510109 ZONES 12,19,85,93

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31167 ABORT: 3/3

ITEM: HYBRID DRIVER CONTROLLER (TYPE 1)
FAILURE MODE: LOSS OF OUTPUT, INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA - 2 & 3
- 3) HYBRID DRIVER CONTROLLER (2), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD LCA - 2 & 3 82V76A17-AR 83V76A18-AR
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

HDC'S POWER LEFT/RIGHT MAIN GEAR EVENT INDICATORS (DS3,DS2),
NONCRITICAL MONITORING FUNCTION.

REFERENCES: VS70-510109 ZONES 14,87

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/03/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 2/1R
MDAC ID: 31168 ABORT: 2/1R

ITEM: LATCHING RELAY (6), LDG GR 'ARM' CONTROL CIRCUITS
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA-1,2,3
- 3) LATCHING RELAY (6), 4PDT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	/NA	TAL:	2/1R
ONORBIT:	/NA	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FWD PCA-1,2,3 82V76A23-K7,K15 81V76A22-K6,K7
83V76A24-K8,K11
PART NUMBER: MC455-0128-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION, CHEMICAL DEGRADED MATERIALS

EFFECTS/RATIONALE:

THE RELAY 'ARMS' AND CONNECTS MONITORS FOR THE LDG GR CONTROL VALVES, PYRO UPLOCK RELEASE CIRCUITS AND NLG EXT PYRO ASSIST CKTS. THE ASSOCIATED LDG GR 'DOWN' RELAYS, WHEN COMMANDED, COMPLETES THE SERIES CIRCUIT AND ALLOWS FOR PROTECTION AGAINST PREMATURES. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF SECOND FAILURE; NLG MAY FAIL TO EXTEND IN THE REQUIRED AMOUNT OF TIME.

REFERENCES: VS70-510109 ZONES 33,38,41,57,62,68

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/03/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31169 ABORT: 3/1R

ITEM: LATCHING RELAY (6), LDG GR 'ARM' CONTROL CIRCUITS
FAILURE MODE: FAILS CLOSED, SHORTED CONTACTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA-1,2,3
- 3) LATCHING RELAY (6), 4PDT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FWD PCA-1,2,3 82V76A23-K7,K15 81V76A22-K6,K7
83V76A24-K8,K11
PART NUMBER: MC455-0128-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

THE RELAY 'ARMS' AND CONNECTS MONITORS FOR THE LDG GR CONTROL VALVES, PYRO UPLOCK RELEASE CIRCUITS AND NLG EXT PYRO ASSIST CKTS. THE ASSOCIATED LDG GR 'DOWN' RELAYS, WHEN COMMANDED, COMPLETES THE SERIES CIRCUIT AND ALLOWS FOR PROTECTION AGAINST PREMATURES. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF 'DOWN' RELAY REDUNDANCY.

REFERENCES: VS70-510109 ZONES 33,38,41,57,62,68

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/03/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 2/1R
MDAC ID: 31170 ABORT: 2/1R

ITEM: LATCHING RELAY (6), LDG GR 'DOWN' CONTROL CIRCUITS
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA-1,2,3
- 3) LATCHING RELAY (6), 4PDT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	2/1R
LIFTOFF:	/NA		TAL:	2/1R
ONORBIT:	/NA		AOA:	2/1R
DEORBIT:	2/1R		ATO:	2/1R
LANDING/SAFING:	2/1R			

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FWD PCA-1,2,3 81V76A22-K8 82V76A23-K6,K8
83V76A24-K7,K9,K10
PART NUMBER: MC455-0128-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

THE 'LDG GR DOWN' RELAYS WITH THE 'ARM' RELAYS ACTUATES THE CIRCUITS FOR THE LDG GR CONTROL VALVES, PYRO UPLOCK RELEASE CRTS, AND NLG EXT PYRO ASSIST CKTS. PROTECTION AGAINST PREMATURES AND REDUNDANCY PROVIDED WITHIN LDG GR CIRCUITS. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF SECOND FAILURE; NLG MAY FAIL TO EXTEND IN THE REQUIRED AMOUNT OF TIME.

REFERENCES: VS70-510109 ZONES 32,36,40,56,62,69

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/03/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31171 ABORT: 3/1R

ITEM: LATCHING RELAY (6), LDG GR 'DOWN' CONTROL CIRCUITS
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA-1,2,3
- 3) LATCHING RELAY (6), 4 PDT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/1R
LIFTOFF:	/NA	TAL: 3/1R
ONORBIT:	/NA	AOA: 3/1R
DEORBIT:	3/1R	ATO: 3/1R
LANDING/SAFING:	3/1R	

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FWD PCA-1,2,3 81V76A22-K8 82V76A23-K6,K8
83V76A24-K7,K9,K10
PART NUMBER: MC455-0128-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

THE 'LDG GR DOWN' RELAYS WITH THE 'ARM' RELAYS ACTUATES THE CIRCUITS FOR THE LDG GR CONTROL VALVES, PYRO UPLOCK RELEASE CRTS, AND NLG EXT PYRO ASSIST CKTS. PROTECTION AGAINST PREMATURES AND REDUNDANCY PROVIDED WITHIN LDG GR CIRCUITS. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF 'ARM' RELAY REDUNDANCY.

REFERENCES: VS70-510109 ZONES 32,36,40,56,62,69

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/05/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31172 ABORT: 3/3

ITEM: GENERAL PURPOSE RELAY (2)
FAILURE MODE: FAILS OPEN, FAILS CLOSED

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD MCA 2 & 3
- 3) GENERAL PURPOSE RELAY (2)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD MCA 2 & 3 82V76A112-K32 83V76A113-K28
PART NUMBER: MC455-0129-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES THE MEANS TO SWITCH THE PROX. SENSOR BOXES TO A GSE SOURCE DURING GROUND OPERATIONS TO RAISE AND LOWER THE MAIN GEAR. GROUND FUNCTION ONLY.

REFERENCES: VS70-510109 ZONES 11,78

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/05/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31173 ABORT: 3/1R

ITEM: REMOTE POWER CONTROLLER (2), 3 AMPS
FAILURE MODE: LOSS OF OUTPUT, OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA 2 & 3
- 3) RPC (2), REDUNDANT SHUTOFF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FWD PCA-2 & 3 82V76A23-RPC42 82V76A24-RPC43
PART NUMBER: MC450-0017-2030

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

CONNECTS MAIN DC BUSS POWER TO THE LDG REDUNDANT SHUTOFF VALVE.
REDUNDANT POWER AND CONTROL PROVIDED BY SECOND MAIN DC BUSS AND
RPC. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL
POWER TO RPC TO POWER SHUTOFF VALVE.

REFERENCES: VS70-510109 ZONES 57,61

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/05/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31174 ABORT: 3/1R

ITEM: REMOTE POWER CONTROLLER (2), 3 AMPS
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA 2 & 3
- 3) RPC (2), REDUNDANT SHUTOFF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	/NA		TAL:	3/1R
ONORBIT:	/NA		AOA:	3/1R
DEORBIT:	3/1R		ATO:	3/1R
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FWD PCA-2 & 3 82V76A23-RPC42 82V76A24-RPC43
PART NUMBER: MC450-0017-2030

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

CONNECTS MAIN DC BUSS POWER TO THE LDG REDUNDANT SHUTOFF VALVE. REDUNDANT POWER AND CONTROL PROVIDED BY SECOND MAIN DC BUSS AND RPC. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF INADVERTENT RPC OUTPUT.

REFERENCES: VS70-510109 ZONES 57,61

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/05/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31175 ABORT: 3/1R

ITEM: PYRO INITIATOR CONTROLLER (6)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA 2 & 3
- 3) PIC (6), NLG, LMG & RMG EMERGENCY UPLK RELEASE 1 & 2
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	/NA		TAL:	3/1R
ONORBIT:	/NA		AOA:	3/1R
DEORBIT:	3/1R		ATO:	3/1R
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FLCA 2 & 3 82V76A17-PIC(3) 83V76A18-PIC(3)
PART NUMBER: MC450-0018-0005

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

AFTER RECEIVING THE 'ARM', 'FIRE-1', AND FIRE-2' STIMULI (LDG GR DOWN COMMANDS), THE PIC'S ELECTRICAL OUTPUT FIRES THE SQ1 & SQ2 EXPLOSIVE INITIATORS FOR NLG, LMG, & RMG BACKUP UPLK RELEASE 1 & 2. POSSIBLE LOSS OF CAPABILITY TO COMPLETE FIRING CIRCUIT TO NLG, LMG, & RMG EMERGENCY UPLOCK RELEASES.

REFERENCES: VS70-510109 ZONES 14,21,52,65,87,94

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/05/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31176 ABORT: 3/1R

ITEM: PYRO INITIATOR CONTROLLER (6)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA 2 & 3
- 3) PIC (6), NLG, LMG & RMG EMERGENCY UPLK RELEASE 1 & 2
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FLCA 2 & 3 82V76A17-PIC(3) 83V76A18-PIC(3)
PART NUMBER: MC450-0018-0005

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

AFTER RECEIVING THE 'ARM', 'FIRE-1', AND FIRE-2' STIMULI (LDG GR DOWN COMMANDS), THE PIC'S ELECTRICAL OUTPUT FIRES THE SQ1 & SQ2 EXPLOSIVE INITIATORS FOR NLG, LMG, & RMG BACKUP UPLK RELEASE 1 & 2. POSSIBLE LOSS OF CREW/VEHICLE IF ALL PIC REDUNDANCY IS LOST.

REFERENCES: VS70-510109 ZONES 14,21,52,65,87,94

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/05/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 2/1R
MDAC ID: 31177 ABORT: 2/1R

ITEM: PYRO INITIATOR CONTROLLER (2)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA 2 & 3
- 3) PIC (2), NLG EXTENSION POWERED ASSIST 1 & 2
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	/NA	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FLCA 2 & 3 82V76A17-PIC 83V76A18-PIC
PART NUMBER: MC450-0018-0005

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

AFTER RECEIVING LANDING GEAR DOWN COMMANDS AND THE NLG DOES NOT COME DOWN (NO GEAR RELEASE INHIBIT IS RECEIVED), THE SQ1 & SQ2 EXPLOSIVE INITIATORS WILL BE FIRED TO BRING THE NLG DOWN. HARDWARE CRIT. 2 FOR TIME CRITICAL NLG DOWN ON APPROACH & LANDING.

REFERENCES: VS70-510109 ZONES 126,132

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/05/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31178 ABORT: 3/1R

ITEM: PYRO INITIATOR CONTROLLER (2)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD LCA 2 & 3
- 3) PIC (2), NLG EXTENSION POWERED ASSIST 1 & 2
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FLCA 2 & 3 82V76A17-PIC 83V76A18-PIC
PART NUMBER: MC450-0018-0005

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

AFTER RECEIVING LANDING GEAR DOWN COMMANDS AND THE NLG DOES NOT COME DOWN (NO GEAR RELEASE INHIBIT IS RECEIVED), THE SQ1 & SQ2 EXPLOSIVE INITIATORS WILL BE FIRED TO BRING THE NLG DOWN. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF PIC REDUNDANCY.

REFERENCES: VS70-510109 ZONES 126,132

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/07/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31179 ABORT: 3/3

ITEM: ANNUNCIATOR LIGHT (4)
FAILURE MODE: FAILS OPEN, FAILS TO INDICATE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) PANELS F6A5 & F8A5
- 3) ANNUNCIATOR LIGHT (4), LDG GR 'ARM' & LDG GR 'DOWN'
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANELS F6A5 & F8A5 34V73A6A5(2) 34V73A8A5(2)
PART NUMBER: UNKNOWN

CAUSES: MECHANICAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

VISUAL MONITORING OF LANDING GEAR 'ARM' AND 'DOWN' PUSH BUTTON
CIRCUITS. NONCRITICAL MONITORING FUNCTION.

REFERENCES: VS70-510109 ZONE 46

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/07/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31180 ABORT: 3/3

ITEM: ANNUNCIATOR CONTROL ASSEMBLY (2)
FAILURE MODE: LOSS OF OUTPUT (ON CHANNELS 31,33,36,40)

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) AREA 30 FLIGHT DECK
- 3) ANNUNCIATOR CONTROL ASSEMBLIES 2 & 3
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: 30V73A18 30V73A17
PART NUMBER: MC434-0283-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:
PROVIDES POWER TO LANDING GEAR 'ARM' AND 'DOWN' ANNUNCIATOR LIGHTS. NONCRITICAL OPERATION.

REFERENCES: VS70-510109 ZONE 44

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/07/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31181 ABORT: 3/1R

ITEM: MAIN GEAR BRAKE UPLOCK RELEASE CIRCUITS 1 & 2
FAILURE MODE: LOSS OF POWER, OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FLCA 2 & 3
- 3) LEFT & RIGHT MAIN GEAR BRAKE UPLOCK RELEASE CIRCUITS 1 & 2
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FLCA 2 & 3 82V76A17 83V76A18
PART NUMBER: NA

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

CIRCUIT SUPPLIES CONTROL POWER TO LEFT/RIGHT MAIN LANDING GEAR BACK UPLOCK RELEASE SUBSYSTEM. THIS CIRCUIT IS A BACKUP TO THE PRIMARY HYDRAULIC SYSTEM. MDAC ID'S 31120, 31128, 31129, 31156, 31157, 31163 THROUGH 31166 COVER ALL THE COMPONENTS IN THIS CIRCUIT. COMPONENT LIST: PIC'S (4), HDC TYPE 1 (4), HDC TYPE 2 (4), HDC TYPE 3 (4), RESISTORS (8), DIODES (4).

REFERENCES: VS70-510109 ZONES 14,21,87,94

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/07/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31182 ABORT: 3/1R

ITEM: NOSE LANDING GEAR BRAKE UPLOCK RELEASE CIRCUIT
NO'S 1 & 2
FAILURE MODE: LOSS OF POWER, OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FLCA 2 & 3
- 3) NOSE LANDING GEAR BRAKE UPLOCK RELEASE CIRCUIT NO'S 1 & 2
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FLCA 2 & 3 82V76A17 83V76A18
PART NUMBER: NA

CAUSES: PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

CIRCUIT SUPPLIES CONTROL POWER TO NOSE LANDING GEAR BRAKE UPLOCK RELEASE SUBSYSTEM. THIS CIRCUIT IS A BACKUP TO THE PRIMARY HYDRAULIC SYSTEM. MDAC ID'S 31120, 31121, 31128 THROUGH 31129, 31154 THROUGH 31160, AND 31175 THROUGH 31176 COVER ALL THE COMPONENTS IN THIS CIRCUIT. COMPONENT LIST: PIC'S (2), HDC TYPE 1 (2), HDC TYPE 2 (2), HDC TYPE 3 (2), RESISTORS (4), DIODES (2).

REFERENCES: VS70-510109 ZONES 54,63

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 2/1R
MDAC ID: 31183 ABORT: 2/1R

ITEM: DIODE, 12 AMP
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA 1
- 3) BLOCKING DIODE, 12 AMP, ARM & DOWN RELAY CIRCUIT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	/NA	TAL:	2/1R
ONORBIT:	/NA	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	2/1R		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: FWD PCA 1 81V76A22-CR12
PART NUMBER: JANTXV1N5551

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

ISOLATES K6 & K7 ARM RELAYS FROM THE K8 DOWN RELAY; ALSO IN CIRCUIT SUPPLYING POWER TO THE LDG GEAR CONTROL VALVE AND THE LDG GEAR DUMP CONTROL VALVE. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF POWER TO OPERATE THESE VALVES.

REFERENCES: VS70-510109: ZONE 68 HYD/WSB SUBSYSTEM: MDAC ID'S 472,473,491,492

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31184 ABORT: 3/3

ITEM: DIODE, 12 AMP
FAILURE MODE: SHORTS, LOW RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA 1
- 3) BLOCKING DIODE, 12 AMP, ARM & DOWN RELAY CIRCUIT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA 1 81V76A22-CR12
PART NUMBER: JANTXV1N5551

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

ISOLATES K6 & K7 ARM RELAYS FROM THE K8 DOWN RELAY; ALSO IN CIRCUIT SUPPLYING POWER TO THE LDG GEAR CONTROL VALVE AND THE LDG GEAR DUMP CONTROL VALVE. POSSIBLE RELAY DAMAGE IF DIODE FAILS SHORTED, BUT NO EFFECT ON MISSION/CREW/VEHICLE.

REFERENCES: VS70-510109: ZONE 68 HYD/WSB SUBSYSTEM: MDAC ID'S 472,473,491,492

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31185 ABORT: 3/3

ITEM: DIODE, 12 AMP
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) LANDING GEAR CONTROL
- 2) FWD PCA 1
- 3) TRANSIENT SUPPRESSION DIODE, 12 AMP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BA

	CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT		HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA 1 81V76A22-CR42
PART NUMBER: JANTXV1N5551

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES TRANSIENT SUPPRESSION TO SOLENOID COILS OF LDG GEAR
CONTROL VALVE AND LDG GEAR DUMP CONTROL VALVE FROM GSE TESTS.
NOT USED IN FLIGHT.

REFERENCES: VS70-510109 ZONE 68

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31200 ABORT: 3/3

ITEM: ISOLATION RESISTOR, 5.1K, 1/4W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA 1
- 3) ISOLATION RESISTOR (1), 5.1K, 1/4W
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA NO. 1 81V76A22-A1R80
PART NUMBER: RLR07C5101GR

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

LIMITS CURRENT BETWEEN MDM AND ANTI-SKID BUSS C/A, NONCRITICAL OPERATION.

REFERENCES: VS70-520109 ZONE 31

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31201 ABORT: 3/1R

ITEM: GENERAL PURPOSE FUSE (8), 3 AMP
FAILURE MODE: OPENS, PREMATURELY OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA 1 & 2
- 3) GENERAL PURPOSE FUSES (8), BRAKE SUB-BUS, 3 AMP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/1R
LIFTOFF:	/NA	TAL: 3/1R
ONORBIT:	/NA	AOA: 3/1R
DEORBIT:	3/1R	ATO: 3/1R
LANDING/SAFING:	3/1R	

REDUNDANCY SCREENS: A [1] B [F] C [P]

LOCATION: FWD PCA 1 & 2 81V76A22-F15,F16,F17,F21 82V76A23-F9,F10,F11,F12
PART NUMBER: ME451-0009-1003

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, CHEMICAL DEGRADED MATERIALS

EFFECTS/RATIONALE:

PROVIDES CIRCUIT PROTECTION BETWEEN BRAKE SUB-BUSES AND BRAKE/SKID CONTROL BOXES. POSSIBLE LOSS OF VEHICLE BECAUSE OF LOSS OF ELECTRICAL POWER.

REFERENCES: VS70-520109 ZONES 9,19

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31202 ABORT: 3/1R

ITEM: FUSE (5 AMP), 2
FAILURE MODE: OPENS, PREMATURELY OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA 1 & 2
- 3) FUSE (2, 5 AMP), BRAKE SUB-BUS/ANTI-SKID POWER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	/NA		TAL:	3/1R
ONORBIT:	/NA		AOA:	3/1R
DEORBIT:	3/1R		ATO:	3/1R
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FWD PCA 1 & 2 81V76A22-F28 82V76A23-F8
PART NUMBER: ME451-0009-1021

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, CHEMICAL
DEGRADED

EFFECTS/RATIONALE:

PROVIDES CURRENT PROTECTION TO BRAKE AND ANTI-SKID SUB-BUSSES.
POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL
POWER.

REFERENCES: VS70-520109 ZONES 30,31

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31203 ABORT: 3/3

ITEM: ANNUNCIATOR
FAILURE MODE: FAILS OPEN, FAILS TO INDICATE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANEL F3
- 3) ANNUNCIATOR, ANTI-SKID FAIL LIGHT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/3
LIFTOFF:	/NA	TAL: 3/3
ONORBIT:	/NA	AOA: 3/3
DEORBIT:	3/3	ATO: 3/3
LANDING/SAFING:	3/3	

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANEL F3 34V73A3-XDS4
PART NUMBER: MC434-0075-0012

CAUSES: MECHANICAL SHOCK, VIBRATION

EFFECTS/RATIONALE:
VISUAL MONITORING OF ANTI-SKID FAILURE, NONCRITICAL OPERATION.

REFERENCES: VS70-520109 ZONE 27

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31204 ABORT: 3/3

ITEM: FUSE, 1 AMP
FAILURE MODE: OPENS, PREMATURELY OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANEL L2A1
- 3) FUSE, 1 AMP, BRAKE/SKI CONTROL CRT.
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANEL L2A1 31V73A2A1-F7
PART NUMBER: ME451-0018-0100

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, CHEMICAL
DEGRADED MATERIALS

EFFECTS/RATIONALE:
PROVIDES CIRCUIT PROTECTION FOR WIRING IN ANTI-SKID FAIL CIRCUIT.
NONCRITICAL OPERATION.

REFERENCES: VS70-520109 ZONE 30

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31205 ABORT: 3/1R

ITEM: GENERAL PURPOSE FUSE (8), 2 AMP
FAILURE MODE: OPENS, PREMATURELY OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA 1 & 2
- 3) GENERAL PURPOSE FUSES (8), ANTI-SKID BUSES, 2 AMP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [F] C [P]

LOCATION: FWD PCA 1 & 2 81V76A22-F18,F19,F20,F22 82V76A23-F13,F14,F15,F16
PART NUMBER: ME451-0009-1002

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, CHEMICAL
DEGRADED MATERIALS

EFFECTS/RATIONALE:

PROVIDES CIRCUIT PROTECTION BETWEEN ANTI-SKID BUSES AND
BRAKE/SKID BOXES. POSSIBLE LOSS OF VEHICLE BECAUSE OF LOSS OF
ELECTRICAL POWER.

REFERENCES: VS70-520109 ZONES 9,19

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31206 ABORT: 3/3

ITEM: ISOLATION RESISTOR (3), 5.1K, 1/4 WATT
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA 1,2 & 3
- 3) RESISTOR (3), BRAKE-SKID POWER/SWITCH SCAN
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA 1,2 & 3 81V76A22-A1R64 82V76A23-A1R1
83V76A24-A1R1
PART NUMBER: RLR07C5101GR

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

RESTRICTS CURRENT BETWEEN CONTROL CIRCUITS AND MDM MONITORING
CIRCUITS. NONCRITICAL FUNCTION.

REFERENCES: VS70-520109 ZONES 10,14,17

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31207 ABORT: 3/3

ITEM: ISOLATION RESISTOR (4), 2.2K, 1/2W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA-1,2,3
- 3) ISOLATION RESISTORS (4), 2.2K, 1/2W
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA - 1,2,3 81V76A22-A1R5 82V76A23-A1R22
83V76A24-A1R18,A1R19
PART NUMBER: RLR20C2201GR

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

ISOLATES AND LIMITS CURRENT BETWEEN THE RPC OUTPUT AND THE MDM
MONITORING CIRCUIT FOR DETERMINING AN RPC'S OPERATING STATUS,
NONCRITICAL FUNCTION.

REFERENCES: VS70-520109 ZONES 11,14,17

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31208 ABORT: 3/3

ITEM: CURRENT LIMITING RESISTOR (4), 1.21K, 2W
FAILURE MODE: SHORTS (LOW RESISTANCE)

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANELS 014, 015, 016
- 3) CURRENT LIMITING RESISTOR (4), 1.21K, 2W
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANELS 014, 015, 016 33V73A14-A1R1, 33V73A16-A1R1,
33V73A15-A1R1, 33V73A16-A1R2
PART NUMBER: RWR80S1211FR

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

LIMITS CURRENT TO THE RPC CONTROL CIRCUITS FOR POWER "ON" TO THE
BRAKE AND ANTI-SKID SYSTEM. NONCRITICAL OPERATION, RPC'S ARE
OVERCURRENT PROTECTED.

REFERENCES: VS70-520109 ZONES 11,13,15,17

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31209 ABORT: 3/3

ITEM: RESISTOR (4), 1.8K, 1/4W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA-1,2,3
- 3) BLEED-OFF RESISTORS (4), 1.8K, 1/4W
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/3
LIFTOFF:	/NA	TAL: 3/3
ONORBIT:	/NA	AOA: 3/3
DEORBIT:	3/3	ATO: 3/3
LANDING/SAFING:	3/3	

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA-1,2,3 81V76A22-A1R42 82V76A23-A1R57
83V76A24-A1R49,A1R50
PART NUMBER: RLR07C1801GR

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

PROVIDES A BLEED-OFF LINE TO THE RETURN BUS, NONCRITICAL FAILURE.

REFERENCES: VS70-520109 ZONES 11,14,17

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31210 ABORT: 3/1R

ITEM: CURRENT LIMITING RESISTOR (4), 1.21K, 2W
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANELS 014,015,016
- 3) CURRENT LIMITING RESISTOR (4), 1.21K, 2W
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [F] C [P]

LOCATION: PANELS 014,015,016 33V73A14-A1R1 33V73A15-A1R1
33V73A16-A1R1 33V73A16-A1R2
PART NUMBER: RWR80S1211FR

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

LIMITS CURRENT TO THE RPC CONTROL CIRCUITS FOR POWER "ON" TO THE
BRAKE AND ANTI-SKID SYSTEM. POSSIBLE LOSS OF CREW/VEHICLE
BECAUSE OF LOSS OF ELECTRICAL POWER.

REFERENCES: VS70-520109 ZONES 11,13,15,17

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31211 ABORT: 3/1R

ITEM: BLOCKING DIODE (4), 12 AMP
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA 1 & 2
- 3) BLOCKING DIODES (4), POWER "ON" BRAKE CIRCUIT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FWD PCA 1 & 2 81V76A22-CR7,CR8 82V76A23-CR18,CR19
PART NUMBER: JANTX1N1204RA

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

PROVIDES BUS ISOLATION IN THE EVENT OF AN RPC FAILING CLOSED.
POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF SKID CONTROL
FUNCTION.

REFERENCES: VS70-520109 ZONES 11,16

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31212 ABORT: 3/3

ITEM: BLOCKING DIODE (4), 12 AMP
FAILURE MODE: SHORTS (LOW RESISTANCE)

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA 1 & 2
- 3) BLOCKING DIODES (4), POWER "ON" BRAKE CIRCUIT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA 1 & 2 81V76A22-CR7,CR8 82V76A23-CR18,CR19
PART NUMBER: JANTX1N1204RA

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

PROVIDES BUS ISOLATION IN THE EVENT OF AN RPC FAILING CLOSED. NO
EFFECT ON CREW/VEHICLE BECAUSE OF RPC OVERCURRENT PROTECTION.

REFERENCES: VS70-520109 ZONES 11,16

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31213 ABORT: 3/1R

ITEM: GENERAL PURPOSE RELAY, NONLATCHING (2)
FAILURE MODE: FAILS OPEN (RELAYS NORMALLY OPEN)

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA 1 & 2
- 3) G.P. RELAYS (2), BRAKE SUB-BUS/WOW CKT POWER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [F] C [P]

LOCATION: FWD PCA-1 & 2 81V76A22-K9 82V76A23-K11
PART NUMBER: MC455-0129-0001

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL
FAILURE, CONTAMINATION

EFFECTS/RATIONALE:

TRANSFERS BRAKE SUB-BUS POWER TO THE WOW CIRCUITS WITHIN THE
BRAKE/SKID CONTROL UNITS. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE
LOSS OF ANTI-SKID CAPABILITY, PILOT WOULD HAVE TO USE MANUAL
BRAKING.

REFERENCES: VS70-520109 ZONES 7,21 SHUTTLE SYSTEM HANDBOOK
DRAWING 13.2

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31214 ABORT: 3/1R

ITEM: GENERAL PURPOSE RELAY, NONLATCHING (2)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA 1 & 2
- 3) G.P. RELAYS (2), BRAKE SUB-BUS/WOW CKT POWER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [F] C [P]

LOCATION: FWD PCA-1 & 2 81V76A22-K9 82V76A23-K11
PART NUMBER: MC455-0129-0001

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL
FAILURE, CONTAMINATION

EFFECTS/RATIONALE:

TRANSFERS BRAKE SUB-BUS POWER TO THE WOW CIRCUITS WITHIN THE
BRAKE/SKID CONTROL UNITS. IF A RELAY(S) FAILS TO OPEN AT LG WOW
WITH THE ANTI-SKID SWITCH ON, THE ANTI-SKID FAIL LIGHT WILL COME
ON. THE PILOT WILL SWITCH ANTI-SKID "OFF" AND APPLY MANUAL
BRAKING. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ANTI-
SKID FUNCTION.

REFERENCES: VS70-520109 ZONES 7,21 SHUTTLE SYSTEM HANDBOOK
DRAWING 13.2

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31215 ABORT: 3/3

ITEM: BLOCKING DIODES (9), 3 AMP
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD LCA NO 1 & 2
- 3) BLOCKING DIODES (9), ANTI-SKID FAIL LIGHT/CONTROL CKT.
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	/NA		TAL:	3/3
ONORBIT:	/NA		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD LCA 1 & 2 82V76A17-CR(5) 81V76A16-CR(4)
PART NUMBER: JANTXV1N5551

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

BLOCKS SIGNAL FEEDBACK ON VARIOUS SIGNALS IN ANTI-SKID FAIL
LIGHT/CONTROL CIRCUIT. NONCRITICAL FUNCTION.

REFERENCES: VS70-520109 ZONE 28

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31216 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (3), TYPE 1
FAILURE MODE: LOSS OF OUTPUT, OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD LCA 1 & 2
- 3) HYBRID DRIVER CONTROLLERS (3), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: FWD LCA 1 & 2 81V76A16-AR(2) 82V76A17-AR(1)
PART NUMBER: MC477-0261-0002

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

WITH ABSENCE OF WOW, THE HDC'S CONNECT MAIN BUS POWER TO RELAYS WHICH TRANSFER BRAKE POWER IN THE BRAKE/SKID CONTROL UNIT. ON LMG/RMG TOUCHDOWN, THE OPENING OF THE HDC'S ENERGIZES THE ANTI-SKID CONTROL CIRCUITS. LOSS OF CONTROL POWER TO ONE "NO-WOW" RELAY COIL, POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL POWER.

REFERENCES: VS70-520109 ZONES 5,22

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31217 ABORT: 3/3

ITEM: HYBRID DRIVER CONTROLLER (3), TYPE 1
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD LCA
- 3) HYBRID DRIVER CONTROLLERS (3), TYPE 1
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD LCA 1 & 2 81V76A16-AR(2) 82V76A17-AR(1)
PART NUMBER: MC477-0261-0002

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

WITH ABSENCE OF WOW, THE HDC'S CONNECT MAIN BUS POWER TO RELAYS WHICH TRANSFER BRAKE POWER IN THE BRAKE/SKID CONTROL UNIT. ON LMG/RMG TOUCHDOWN, THE OPENING OF THE HDC'S ENERGIZES THE ANTI-SKID CONTROL CIRCUITS. TWO HDC FAILURES REQUIRED BEFORE PREMATURELY CLOSING A RELAY CONTACT, NO EFFECT ON MISSION/CREW/VEHICLE.

REFERENCES: VS70-520109 ZONES 5,22

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31218 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (TYPE 3)
FAILURE MODE: LOSS OF OUTPUT, OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD LCA 2
- 3) HYBRID DRIVER CONTROLLER, TYPE 3
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: FWD LCA 2 82V76A17-AR(1)
PART NUMBER: MC477-0263-0002

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

WITH ABSENCE OF WOW, THE HDC CONNECTS MAIN BUS POWER TO RELAY (K11) WHICH TRANSFERS BRAKE POWER IN THE BRAKE/SKID CONTROL UNIT B. ON LMG/RMG TOUCHDOWN, THE OPENING OF THE HDC'S ENERGIZES THE ANTI-SKID CONTROL CIRCUITS. LOSS OF CONTROL POWER TO K11 RELAY COIL, POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF ELECTRICAL POWER.

REFERENCES: VS70-520109 ZONE 22

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31219 ABORT: 3/3

ITEM: HYBRID DRIVER CONTROLLER (TYPE 3)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD LCA 2
- 3) HYBRID DRIVER CONTROLLER, TYPE 3
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	HDW/FUNC
		ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD LCA 2 82V76A17-AR(1)
PART NUMBER: MC477-0263-0002

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

WITH ABSENCE OF WOW, THE HDC CONNECTS MAIN BUS POWER TO RELAY (K11) WHICH TRANSFERS BRAKE POWER IN THE BRAKE/SKID CONTROL UNIT B. ON LMG/RMG TOUCHDOWN, THE OPENING OF THE HDC'S ENERGIZES THE ANTI-SKID CONTROL CIRCUITS. TWO HDC FAILURES REQUIRED BEFORE PREMATURELY CLOSING A RELAY CONTACT, NO EFFECT ON MISSION/CREW/VEHICLE.

REFERENCES: VS70-520109 ZONE 22

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31220 ABORT: 3/1R

ITEM: TOGGLE SWITCH, DPST
FAILURE MODE: FAILS OPEN (ONE POLE AFFECTED)

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANEL L2A1
- 3) TOGGLE SWITCH (1), DPST, ANTI-SKID CONTROL CKT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/1R	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: PANEL L2A1 31V73A2A1-S5
PART NUMBER: ME452-0102-7201

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL
FAILURE, CONTAMINATION

EFFECTS/RATIONALE:

MANUALLY SWITCHES "ON-OFF" ANTI-SKID CONTROL CIRCUIT. EACH POLE CONTROLS POWER TO ONE ANTI-SKID BUS. ONE POLE POSITION WHEN IN "OFF" POSITION CONTROLS ANTI-SKID-FAIL-LIGHT "ON" INDICATION. LOSS OF CAPABILITY TO ENERGIZE ONE SKID BUS AND LOSS OF REDUNDANT SKID CONTROL CIRCUITS TO FOUR WHEELS. WITH LOSS OF ANTI-SKID FUNCTION, SHUTTLE MIGHT BE SAFELY LANDED WITH MANUAL BRAKING.

REFERENCES: VS70-520109: ZONE 31, MDAC 30101, AND 13.2 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31221 ABORT: 3/3

ITEM: TOGGLE SWITCH, DPST
FAILURE MODE: FAILS CLOSED, SHORTED CONTACTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANEL L2A1
- 3) TOGGLE SWITCH (1), DPST, ANTI-SKID CONTROL CKT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	HDW/FUNC	CRITICALITIES ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANEL L2A1 31V73A2A1-S5
PART NUMBER: ME452-0102-7201

CAUSES: MECHANICAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

MANUALLY SWITCHES "ON-OFF" ANTI-SKID CONTROL CIRCUIT. EACH POLE CONTROLS POWER TO ONE ANTI-SKID BUS. ONE POLE POSITION WHEN IN "OFF" POSITION CONTROLS ANTI-SKID-FAIL-LIGHT "ON" INDICATION. CLOSURES - NO EFFECT - NORMAL OPERATING POSITION.

REFERENCES: VS70-520109: ZONE 31, MDAC 30101, AND 13.2 SSSH, JSC 12770 VOL. 10D

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31222 ABORT: 3/1R

ITEM: TOGGLE SWITCH
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANELS 014,015
- 3) TOGGLE SWITCH (2), MAIN BUS (A,B), "ON" CONTROL CKT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: PANELS 014,015 33V73A14-S1 33V73A15-S1
PART NUMBER: ME452-0102-7101

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL
FAILURE, CONTAMINATION

EFFECTS/RATIONALE:

PROVIDES MANUAL SWITCHING FOR REDUNDANT CONTROL AND DC POWER TO
BRAKING CIRCUITS. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS
OF CONTROL TO MAIN DC CONNECTING/DISCONNECTING RPC'S.

REFERENCES: VS70-520109 ZONES 11,16

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31223 ABORT: 3/3

ITEM: TOGGLE SWITCH
FAILURE MODE: FAILS CLOSED, SHORTED CONTACTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANELS 014,015
- 3) TOGGLE SWITCH (2), MAIN BUS (A,B), "ON" CONTROL CKT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	CRITICALITIES	
	HDW/FUNC	ABORT
PRELAUNCH:	3/3	RTLS: 3/3
LIFTOFF:	/NA	TAL: 3/3
ONORBIT:	/NA	AOA: 3/3
DEORBIT:	3/3	ATO: 3/3
LANDING/SAFING:	3/3	

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANELS 014,015 33V73A14-S1 33V73A15-S1
PART NUMBER: ME452-0102-7101

CAUSES: MECHANICAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES MANUAL SWITCHING FOR REDUNDANT CONTROL AND DC POWER TO BRAKING CIRCUITS. FAILS CLOSED HAS NO EFFECT, NORMAL OPERATING CONDITION.

REFERENCES: VS70-520109 ZONES 11,16

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31224 ABORT: 3/1R

ITEM: TOGGLE SWITCH, DPST
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANELS 014,015
- 3) TOGGLE SWITCH, MAIN BUS (C), "ON" CONTROL CKT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: PANEL 016 33V73A16-S1
PART NUMBER: ME452-0102-7201

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL
FAILURE, CONTAMINATION

EFFECTS/RATIONALE:

PROVIES MANUAL SWITCHING FOR REDUNDANT CONTROL AND DC POWER TO
BRAKING CIRCUIT. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS
OF CONTROL TO MAIN C CONNECTING/DISCONNECTING RPC'S.

REFERENCES: VS70-520109 ZONE 14

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31225 ABORT: 3/3

ITEM: TOGGLE SWITCH, DPST
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANELS 014,015
- 3) TOGGLE SWITCH, MAIN BUS (C), "ON" CONTROL CKT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANEL 016 33V73A16-S1
PART NUMBER: ME452-0102-7201

CAUSES: MECHANICAL SHOCK, VIBRATION

EFFECTS/RATIONALE:

PROVIDES MANUAL SWITCHING FOR REDUNDANT CONTROL AND DC POWER TO BRAKING CIRCUIT. FAILS CLOSED HAS NO EFFECT, NORMAL OPERATING CONDITION.

REFERENCES: VS70-520109 ZONE 14

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31226 ABORT: 3/1R

ITEM: REMOTE POWER CONTROLLER (4), 10 AMP
FAILURE MODE: LOSS OF OUTPUT, OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA-1,2,3
- 3) RPC'S (4), 10 AMP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	/NA	TAL:	3/1R
ONORBIT:	/NA	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [1] B [P] C [P]

LOCATION: FWD PCA-1,2,3 81V76A22-RPC-5 82V76A23-RPC-4
83V76A24-RPC-4, RPC-5
PART NUMBER: MC450-0017-2100

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

CONNECTS OR DISCONNECTS MAIN DC BUS POWER TO THE ANTI-SKID AND
BRAKE CONTROL UNITS. PROVIDES CIRCUIT PROTECTION AGAINST
OVERLOADS. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF
ELECTRICAL POWER.

REFERENCES: VS70-520109 ZONES 11,13,15,17

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31227 ABORT: 3/3

ITEM: REMOTE POWER CONTROLLER (4), 10 AMP
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD PCA-1,2,3
- 3) RPC'S (4), 10 AMP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FWD PCA-1,2,3 81V76A22-RPC-5 82V76A23-RPC-4
83V76A24-RPC-4, RPC-5
PART NUMBER: MC450-0017-2100

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

CONNECTS OR DISCONNECTS MAIN DC BUS POWER TO THE ANTI-SKID AND
BRAKE CONTROL UNITS. PROVIDES CIRCUIT PROTECTION AGAINST
OVERLOADS. RPC'S ARE OVERCURRENT PROTECTED IN THE EVENT TWO MAIN
BUSSES ARE POWERING THE BRAKE SUB-BUS AT THE SAME INSTANT.

REFERENCES: VS70-520109 ZONES 11,13,15,17

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31228 ABORT: 3/3

ITEM: TOGGLE SWITCH (3)
FAILURE MODE: FAILS CLOSED, SHORTED CONTACTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANEL R4
- 3) TOGGLE SWITCH (3), CONTROL BUS (AB1,BC1,CA1) HYD BRAKE
HEATER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANEL R4 32V73A4-S28,S29,S30
PART NUMBER: UNKNOWN

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL
FAILURE

EFFECTS/RATIONALE:

PROVIDES MANUAL SWITCHING FOR REDUNDANT DC POWER TO THE BREAK
HYDRAULIC LINE HEATERS. FAILURE HAS NO EFFECT BECAUSE SWITCH IS
IN NORMALLY CLOSED POSITION.

REFERENCES: VS70-958102; 58GC, ZONE 7H; 58GA, ZONES 7H,19H

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31229 ABORT: 3/1R

ITEM: TOGGLE SWITCH (3)
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANEL R4
- 3) TOGGLE SWITCH (3), CONTROL BUS (AB1,BC1,CA1) HYD BRAKE
HEATER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	HDW/FUNC	CRITICALITIES	ABORT	HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/1R
LIFTOFF:	3/3		TAL:	3/1R
ONORBIT:	3/3		AOA:	3/1R
DEORBIT:	3/3		ATO:	3/1R
LANDING/SAFING:	3/1R			

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: PANEL R4 32V73A4-S28, S29, S30
PART NUMBER: UNKNOWN

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PROVIDES MANUAL SWITCH FOR REDUNDANT DC POWER TO THE BREAK
HYDRAULIC LINE HEATERS. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF
LOSS OF ELECTRICAL POWER TO BRAKE HEATERS.

REFERENCES: VS70-958102; 58GC, ZONE 7H; 58GA, ZONES 7H,19H

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31230 ABORT: 3/1R

ITEM: CURRENT LIMITING RESISTOR (3), 1.21K, 2W
FAILURE MODE: ELEMENT OPENS, HIGH RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANEL R4
- 3) RESISTORS (3), 1.21K, 2W
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/3	AOA:	3/1R
DEORBIT:	3/3	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: PANEL R4 32V73A4-A6R1,A6R2,A6R3
PART NUMBER: UNKNOWN

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

LIMITS CURRENT TO THE RPC CONTROL CIRCUITS FOR POWER "ON" TO THE
BRAKE HYDRAULIC LINE HEATERS. POSSIBLE LOSS OF CREW/VEHICLE
BECAUSE OF LOSS OF ELECTRICAL POWER TO BRAKE HEATERS.

REFERENCES: VS70-958102; 58GC, ZONE 7H; 58GA, ZONES 7H,19H

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31231 ABORT: 3/3

ITEM: CURRENT LIMITING RESISTOR (3), 1.21K, 2W
FAILURE MODE: SHORTS, LOW RESISTANCE

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANEL R4
- 3) RESISTORS (3), 1.21K, 2W
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

	CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT		HDW/FUNC
PRELAUNCH:	3/3		RTLS:	3/3
LIFTOFF:	3/3		TAL:	3/3
ONORBIT:	3/3		AOA:	3/3
DEORBIT:	3/3		ATO:	3/3
LANDING/SAFING:	3/3			

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: PANEL R4 32V73A4-A6R1,A6R2,A6R3
PART NUMBER: UNKNOWN

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

LIMITS CURRENT TO THE RPC CONTROL CIRCUITS FOR POWER "ON" TO THE BRAKE/HYDRAULIC LINE HEATERS. FAILURE HAS NO EFFECT ON SUBSYSTEM.

REFERENCES: VS70-958102; 58GC, ZONE 7H; 58GA, ZONES 7H,19H

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/1R
MDAC ID: 31232 ABORT: 3/1R

ITEM: REMOTE POWER CONTROLLER (3), 10 AMP
FAILURE MODE: LOSS OF OUTPUT, OPENS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANEL R4
- 3) MID PCA 1,2,3
- 4) RPC (3), HEATER CONTROL CIRCUIT
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/3	AOA:	3/1R
DEORBIT:	3/3	ATO:	3/1R
LANDING/SAFING:	3/1R		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MID PCA 1,2,3 RPC-37,39,24
PART NUMBER: UNKNOWN

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

CONNECTS OR DISCONNECTS MAIN DC BUS POWER TO THE HYDRAULIC BRAKE
HEATER COILS. POSSIBLE LOSS OF CREW/VEHICLE BECAUSE OF LOSS OF
ELECTRICAL POWER TO HEATER COILS.

REFERENCES: VS70-958102; 58GC, ZONE 7E; 58GA, ZONES 7E,19E

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31233 ABORT: 3/3

ITEM: REMOTE POWER CONTROLLER (3), 10 AMP
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANEL R4
- 3) MID PCA 1,2,3
- 4) RPC (3), HEATER CONTROL CIRCUIT
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: MID PCA 1,2,3 RPC-37,39,24
PART NUMBER: UNKNOWN

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

CONNECTS OR DISCONNECTS MAIN DC BUS POWER TO THE HYDRAULIC BRAKE
HEATER COILS. RPC'S ARE OVERCURRENT PROTECTED, INADVERTENT
OUTPUT WOULD HAVE NO EFFECT ON HEATER COILS.

REFERENCES: VS70-958102; 58GC, ZONE 7E; 58GA, ZONES 7E,19E

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31234 ABORT: 3/3

ITEM: ISOLATION RESISTOR (3), 5.1K, 1/4W
FAILURE MODE: ELEMENT OPENS, SHORTS

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) PANEL R4
- 3) MID PCA 1,2,3
- 4) ISOLATION RESISTOR (3), 5.1K, 1/4W
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: MID PCA 1,2,3 40V76A25-A1R28, 40V76A26-A1R27,
40V76A27-A1R29
PART NUMBER: UNKNOWN

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:
RESTRICTS CURRENT BETWEEN HEATER CONTROL CIRCUITS AND MDM
MONITORING CIRCUITS. NONCRITICAL FUNCTION.

REFERENCES: VS70-958102; 58GC, ZONE 6E; 58GA, ZONES 18E,6E

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31235 ABORT: 3/3

ITEM: ANNUNCIATOR CONTROL ASSEMBLY
FAILURE MODE: LOSS OF OUTPUT (CHANNEL 12)

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD LCA NO 2
- 3) ANNUNCIATOR CONTROL ASSEMBLY NO. 2
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	/NA	TAL:	3/3
ONORBIT:	/NA	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [] B [] C []

LOCATION: FLIGHT DECK AREA 30 30V73A17-NO. 2
PART NUMBER: MC434-0283-0002

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PROVIDES POWER TO ANTI-SKID FAIL ANNUNCIATOR LIGHT, NONCRITICAL
OPERATION.

REFERENCES: VS70-520109, ZONE 27

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31237 ABORT: 3/3

ITEM: SIGNAL CONDITIONER
FAILURE MODE: INADVERTENT OUTPUT, LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD BAY 1, AREA 81W8
- 3) BRAKE/SKID BOX A SIGNAL CONDITIONER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

	CRITICALITIES		
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: FWD BAY 1 AREA 81W8 81V75A16
PART NUMBER: V070-753251

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PROVIDES VOLTAGE REDUCTION AND MDM-OF1 MONITORING TO BRAKE/SKID
CONTROL BOX A. MONITORING FUNCTION HAS NO EFFECT ON
CREW/VEHICLE.

REFERENCES: VS70-520109 ZONES 36,185

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EPD&C FLIGHT: 3/3
MDAC ID: 31239 ABORT: 3/3

ITEM: SIGNAL CONDITIONER
FAILURE MODE: INADVERTENT OUTPUT, LOSS OF OUTPUT

LEAD ANALYST: G. BEAIRD SUBSYS LEAD: SCHMECKPEPER

BREAKDOWN HIERARCHY:

- 1) BRAKE & ANTI-SKID
- 2) FWD BAY 2, AREA 82W9
- 3) BRAKE/SKID BOX B SIGNAL CONDITIONER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9) 05-6BB

FLIGHT PHASE	HDW/FUNC	CRITICALITIES ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

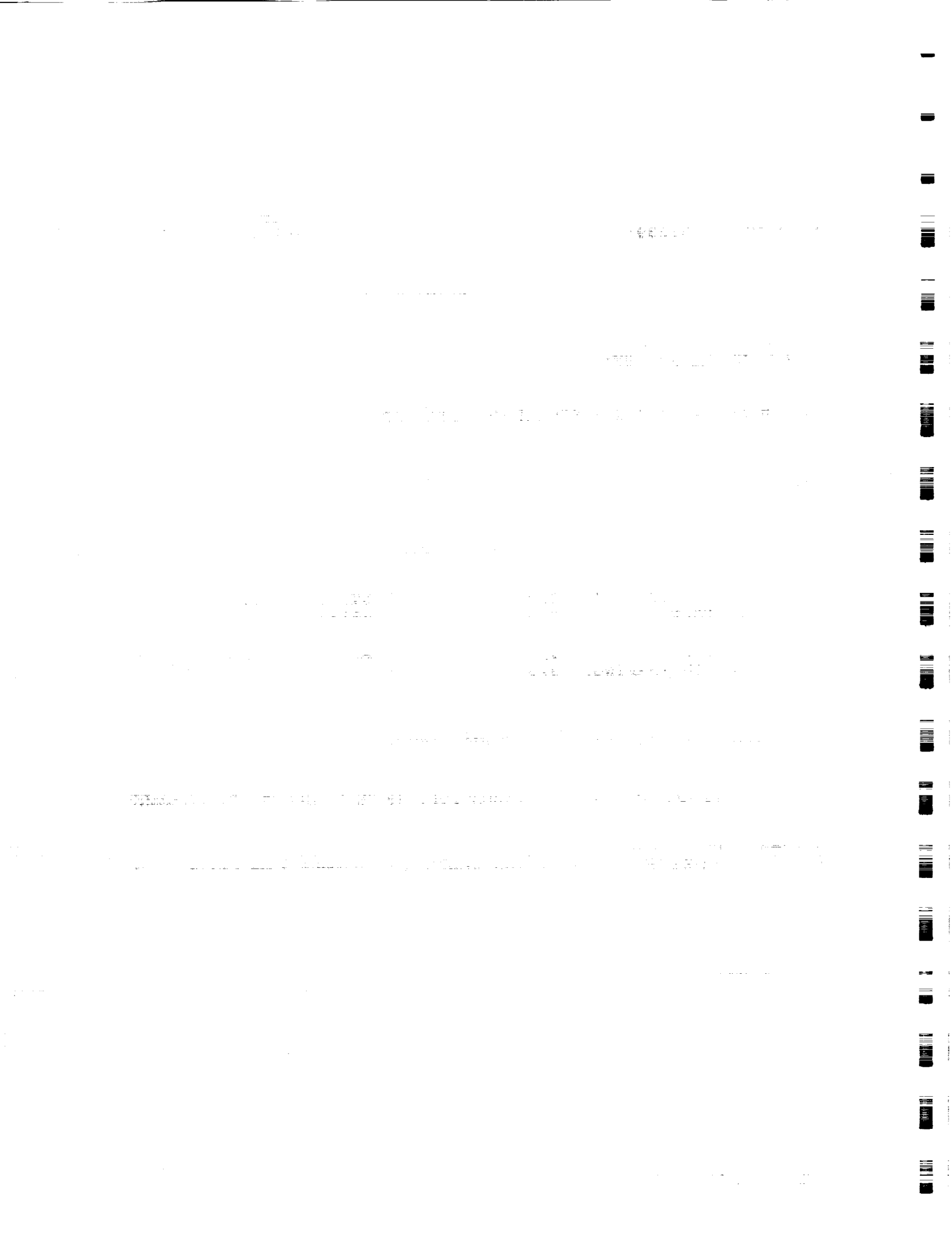
LOCATION: FWD BAY 2 AREA 82W9 82V75A17
PART NUMBER: V070-753252

CAUSES: MECHANICAL SHOCK, VIBRATION, THERMAL SHOCK, PIECE-PART
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PROVIDES VOLTAGE REDUCTION AND MDM-OF2 MONITORING TO BRAKE/SKID
CONTROL BOX B. MONITORING FUNCTION HAS NO EFFECT ON
CREW/VEHICLE.

REFERENCES: VS70-520109 ZONES 41,190



APPENDIX D
POTENTIAL CRITICAL ITEMS

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
10101	TIRES, NLG TYPE II	RUPTURE
10201	NOSE LANDING GEAR TRUNION	STRUCTURAL FAILURE
10202	DRAG BRACE	STRUCTURAL FAILURE
10203	DRAG BRACE TRUNION	STRUCTURAL FAILURE
10204	LOCK BRACE ASSEMBLY	STRUCTURAL FAILURE
10205	DOWNLOCK BUNGEE	PHYSICAL BINDING/JAMMING
10206	DOWNLOCK BUNGEE	STRUCTURAL FAILURE
10209	STEERING COLLAR ASSEMBLY	STRUCTURAL FAILURE
10210	STEERING DISCONNECT LOCK	STRUCTURAL FAILURE
10211	TORQUE ARM ASSEMBLY	STRUCTURAL FAILURE
10212	NOSE WHEEL RETAINING BOLT	CORROSION, STRUCTURAL FAILURE
10213	AXLE	CORROSION, STRUCTURAL FAILURE
10215	SHOCK STRUT	INTERNAL/EXTERNAL LEAKAGE (HYDRAULIC FLUID)
10216	SHOCK STRUT	INTERNAL/EXTERNAL LEAKAGE (NITROGEN)
10217	UPLOCK ROLLER RETAINING ASSEMBLY	STRUCTURAL FAILURE
10220	TORQUE TUBE ASSEMBLY	STRUCTURAL FAILURE
10221	DRAG BRACE	STRUCTURAL FAILURE
10222	DRAG BRACE TRUNION	STRUCTURAL FAILURE
10223	DRAG BRACE TRUNION	STRUCTURAL FAILURE
10224	SUPPORT BEAM	STRUCTURAL FAILURE
10402	NLG EXTEND/RETRACT HYD STRUT ACT	LEAK, EXTERNAL
10404	NLG EXTEND/RETRACT HYD STRUT ACT	RUPTURE
10413	NLG EXTEND/RETRACT HYD STRUT ACT	SHUTTLE VALVE (CLOSED)
10414	NLG EXTEND/RETRACT HYD STRUT ACT	TIMING ORIFICE BLOCKED
10416	NLG EXTEND/RETRACT HYD STRUT ACT	TEMPERATURE TRANSDUCER BOSS LEAK
10501	NLG DOOR EXTEND/RETRACT MECHANISM	STRUCTURAL FAILURE, PHYSICAL BINDING/JAMMING
10701	NLG UPLOCK HOOK ASSEMBLY	STRUCTURAL FAILURE, PHYSICAL BINDING/JAMMING
10901	NLG DOOR HOOK ACT LINKAGE	STRUCTURAL FAILURE, PHYSICAL BINDING/JAMMING
11003	NLG UPLOCK ACTUATOR	LEAK EXTERNAL
11004	NLG UPLOCK ACTUATOR	BROKEN ROD/LINKAGE
11005	NLG UPLOCK ACTUATOR	RUPTURE
11101	NLG B/U PYRO UPLOCK RELEASE MECH	INADVERTANT FIRING
11102	NLG B/U PYRO UPLOCK RELEASE MECH	FAIL TO FIRE

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
11201	NLG EXTENSION BOOSTER PYRO ACT	INADVERTANT FIRING
11202	NLG EXTENSION BOOSTER PYRO ACT	FAIL TO FIRE
11301	NLG DOOR BUNGEE ASSIST ASSY	STRUCTURAL FAILURE, FAILS TO RELEASE
11302	NLG DOOR BUNGEE ASSIST ASSY	STRUCTURAL FAILURE, INADVERTANT RELEASE
20101	TIRES, MLG TYPE I	RUPTURE
20201	SHOCK STRUT STRUCTURE	STRUCTURAL FAILURE
20202	SHOCK STRUT PISTON ASSEMBLY	INTERNAL/EXTERNAL LEAKAGE (HYDRAULIC FLUID)
20203	SHOCK STRUT PISTON ASSEMBLY	INTERNAL/EXTERNAL LEAKAGE (NITROGEN)
20204	TORQUE ARM ASSEMBLY	STRUCTURAL FAILURE
20205	AXLE KIT - MLG	STRUCTURAL FAILURE
20206	LOWER DRAG BRACE STRUT	STRUCTURAL FAILURE
20207	UPPER DRAG BRACE TRUNIONS (2 EA)	STRUCTURAL FAILURE
20208	LOCK BRACE ASSEMBLY	STRUCTURAL FAILURE
20209	DOWN LOCK BUNGEE	PHYSICAL BINDING/JAMMING (BENT BUNGEE)
20210	DOWN LOCK BUNGEE	STRUCTURAL FAILURE
20216	UPLOCK ROLLER RETAINING ASSEMBLY	STRUCTURAL FAILURE
20217	TORQUE TUBE ASSEMBLY	STRUCTURAL FAILURE
20218	SHOCK STRUT ATTACHING TRUNIONS	STRUCTURAL FAILURE
20219	UPPER DRAG BRACE STRUTS (2 EA)	STRUCTURAL FAILURE
20220	CENTER DRAG BRACE TRUNION	STRUCTURAL FAILURE
20221	LOWER DRAG BRACE TRUNION	STRUCTURAL FAILURE
20222	LOCK BRACE CENTER TRUNION	STRUCTURAL FAILURE
20223	SUPPORT BEAM	STRUCTURAL FAILURE
20402	MLG EXTEND/RETRACT HYD STRUT ACT	LEAK, EXTERNAL
20404	MLG EXTEND/RETRACT HYD STRUT ACT	RUPTURE
20413	MLG EXTEND/RETRACT HYD STRUT ACT	SHUTTLE VALVE (CLOSED)
20414	MLG EXTEND/RETRACT HYD STRUT ACT	TIMING ORIFICE BLOCKED
20416	MLG EXTENDED/RETRACT HYD STRUT ACT	TEMPERATURE TRANSDUCER BOSS LEAK
20501	DOOR EXTEND/RETRACT MECH	STRUCTURAL FAILURE, PHYSICAL BINDING/JAMMING/ BREAKING
20601	MLG UPLOCK HOOK ASSEMBLY	STRUCTURAL FAILURE, PHYSICAL BINDING/JAMMING
20701	MLG UPLOCK HOOK ASSEMBLY	STRUCTURAL FAILURE, PHYSICAL BINDING/JAMMING

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
20901	DOOR HOOK ACTUATUON LINKAGE	STRUCTURAL FAILURE, PHYSICAL BINDING/JAMMING
21003	MLG UPLOCK ACTUATOR	LEAK EXTERNAL
21004	MLG UPLOCK ACTUATOR	BROKEN ROD/LINKAGE
21005	MLG UPLOCK ACTUATOR	RUPTURE
21101	MLG PYRO UPLOCK RELEASE	INADVERTANT FIRING
21102	MLG PYRO UPLOCK RELEASE	FAIL TO FIRE
21301	MLG DOOR BOOSTER BUNGEE	FAILS TO FUNCTION
30102	BRAKE PEDAL TRANSDUCER	NO TRANSDUCER DEFLECTION
30104	BRAKE PEDAL TRANSDUCER	SHORT/CLOSED (LVDT)
30105	BRAKE CIRCUIT	OPEN OR SHORT CIRCUIT RESULTING IN AN OPEN VALVE
30106	BRAKE CIRCUIT	OPEN OR SHORT CIRCUIT RESULTING IN A CLOSED VALVE
30110	HYDRAULIC PRESSURE REGULATOR	FAILS OPEN
30111	HYD PRESS REG (SYS 2 & 3)	FAILS CLOSED
30112	INLET FILTER, HYD MODULE ASSY	CLOGGED FILTER (SYSTEM 2&3)
30116	BY - PASS VALVE, HYD MODULE ASSY	FAILS TO OPEN (SYSTEM 1)
30117	SELECTOR VALVE, HYD MODULE ASSY	LEAKAGE
30118	SELECTOR VALVE, HYD MODULE ASSY	JAMMED CLOSED
30121	BRAKE/SKID CONTROL VALVE	JAMMED OPEN
30124	STATORS, ROTORS, CLIPS	STRUCTURAL FAILURE
30125	RUDDER/BRAKE PEDAL ASSEMBLY	STRUCTURAL FAILURE
30126	RUDDER/BRAKE PEDAL ASSEMBLY	BINDING/JAMMING
30129	HYD PRESS REG (SYS 1)	FAILS CLOSED
30130	INLET FILTER, HYD MODULE ASSY (SYS 1)	FILTER CLOGGED
30131	BY - PASS VALVE, HYD MODULE ASSY (SYS 2&3)	FAILS TO OPEN
31101	PROXIMITY SENSOR BOX (2)	INADVERTENT OUTPUT
31107	BLOCKING DIODE (2) 12 AMP, 400V	ELEMENT OPENS, HIGH RESISTANCE
31109	BLOCKING DIODE (2) 12 AMP	ELEMENT OPENS, HIGH RESISTANCE
31113	PUSHBUTTON SWITCH (2), LANDING GEAR DOWN	FAILS OPEN (SWITCHES NORMALLY OPEN)
31117	PUSHBUTTON SWITCH, LDG GR ARM, 4PDT, ILLUMINATED	FAILS OPEN (SWTICHES NORMALLY OPEN)
31125	GENERAL PURPOSE FUSE (5 AMP)	OPENS, PREMATURELY OPENS
31126	GENERAL PURPOSE FUSE, (8), 1 AMP	OPENS, PREMATURELY OPENS
31127	GENERAL PURPOSE FUSE (1 AMP)	OPENS, PREMATURELY OPENS
31128	RESISTOR (12), 10.2 OHMS, 2W	ELEMENT OPENS, HIGH RESISTANCE
31137	GENERAL PURPOSE FUSE (2), 5 AMP	OPENS, PREMATURELY OPENS
31144	HYBRID DRIVER CONTROLLER (TYPE 1)	INADVERTENT OUTPUT

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
31149	HYBRID DRIVER CONTROLLER (TYPE 1)	INADVERTENT OUTPUT
31150	HYBRID DRIVER CONTROLLER (TYPE 1)	LOSS OF OUTPUT
31151	HYBRID DRIVER CONTROLLER (TYPE 1)	INADVERTENT OUTPUT
31152	HYBRID DRIVER CONTROLLER (TYPE II)	LOSS OF OUTPUT
31153	HYBRID DRIVER CONTROLLER (TYPE II)	INADVERTENT OUTPUT
31154	HYBRID DRIVER CONTROLLER (TYPE 3)	LOSS OF OUTPUT
31155	HYBRID DRIVER CONTROLLER (TYPE 3)	INADVERTENT OUTPUT
31156	HYBRID DRIVER CONTROLLER (TYPE 1)	LOSS OF OUTPUT
31157	HYBRID DRIVER CONTROLLER (TYPE 1)	INADVERTENT OUTPUT
31159	HYBRID DRIVER CONTROLLER (TYPE II)	LOSS OF OUTPUT
31160	HYBRID DRIVER CONTROLLER (TYPE II)	INADVERTENT OUTPUT
31161	HYBRID DRIVER CONTROLLER (TYPE 1)	LOSS OF OUTPUT
31163	HYBRID DRIVER CONTROLLER (TYPE II)	LOSS OF OUTPUT
31164	HYBRID DRIVER CONTROLLER (TYPE II)	INADVERTENT OUTPUT
31165	HYBRID DRIVER CONTROLLER (TYPE III)	LOSS OF OUTPUT
31166	HYBRID DRIVER CONTROLLER (TYPE III)	INADVERTENT OUTPUT
31168	LATCHING RELAY (6), LDG GR 'ARM' CONTROL CIRCUITS	FAILS OPEN
31170	LATCHING RELAY (6), LDG GR 'DOWN' CONTROL CIRCUITS	FAILS OPEN
31177	PYRO INITIATOR CONTROLLER (2)	LOSS OF OUTPUT
31181	MAIN GEAR BRAKE UPLOCK RELEASE CIRCUITS 1 & 2	LOSS OF POWER, OPENS
31182	NOSE LANDING GEAR BRAKE UPLOCK RELEASE CIRCUIT NO'S 1 & 2	LOSS OF POWER, OPENS
31183	DIODE, 12 AMP	ELEMENT OPENS, HIGH RESISTANCE
31201	GENERAL PURPOSE FUSE (8), 3 AMP	OPENS, PREMATURELY OPENS
31205	GENERAL PURPOSE FUSE (8), 2 AMP	OPENS, PREMATURELY OPENS
31210	CURRENT LIMITING RESISTOR (4), 1.21K, 2W	ELEMENT OPENS, HIGH RESISTANCE

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
31214	GENERAL PURPOSE RELAY, NONLATCHING (2)	FAILS CLOSED
31213	GENERAL PURPOSE RELAY, NONLATCHING (2)	FAILS OPEN (RELAYS NORMALLY OPEN)

